



Interoffice Communication

JNV

To L. N. Vernon - Saddle Brook
From R. D. Gamblin
Date July 26, 1974
Subject 1975 Preliminary Capital Budget - VCM Plant

Attached is the 1975 Preliminary Capital Budget for the VCM Plant. The plant's capital requirements for 1975 are dependent on whether Item V-1, Phase II Debottlenecking, is approved. This item and Item V-2, Additional Liquid Chlorine Unloading Facilities, were included in this preliminary budget at the request of the Business Area.

If Item V-1 is approved, then Items V-4, Oxychlorination Interchanger and V-7, In Place Spare S-309, will not be applicable as they are also part of V-1. The overall budget will then have a capital requirement of \$2,864,000 with a combined DCF return of 28.9%. This is composed of projects totaling \$2,019,000 with a return of 44.6% and projects totaling \$845,000 with no economic return.

If Item V-1, Phase II Debottlenecking, is not an approved Capital Budget item, then Items V-4, Oxychlorination Interchanger, and V-7, In Place Spare S-309 should be considered as cost savings projects. The 1975 VCM Plant Capital Budget will then have a capital requirement of \$1,320,000 with a combined DCF return of 19.4%. This is composed of projects totaling \$475,000 with a DCF return of 73.2% and projects totaling \$845,000 with no economic return.

In addition to the proposed Capital Budget, two memo items with a total capital requirement of \$5,300,000 are shown. Item V-1M, EPA NPDES Water Compliance Permit (potential requirements) represents the probable capital expenditure requirement that will be necessary if the EPA NPDES draft permit is finalized in its present form. This \$1.3 MM expenditure will be in addition to the V-10, EPA NPDES Water Compliance Permit capital requirement of \$500,000. The plant believes it has valid objections to the draft permit and should be able to obtain revisions.

Item V-2M, Plant Incineration (\$4,000,000 capital) may be required by the EPA as a result of the VCM health problem. The direction of the EPA with regard to this problem is unknown. Item V-2M may also be required as a tars disposal solution. The time required for project execution of this item makes its immediate consideration imperative.

CWH 000006533

L. N. Vernon
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The plant anticipates no capital projects during 1976 or 1977 which will have capital requirements in excess of \$400,000.



R. D. Gamblin

is
Enc
CC + enc:
REL-JAD-RHG-TJG-GGD-JRH
LNW-DEM-JSR-JCL-PLF
GWI-JDBr-LJS-RMH-WCK
JDBu-JJL-DHS

CWH 000006534

1975 CAPITAL BUDGET SUMMARY

LAKE CHARLES VCM PLANT

	<u>Capital (\$)</u>
<u>Plant Expansion and Modernization</u>	
V-1 Phase II Debottlenecking	\$ 1,650,000
V-2 Additional Liquid Chlorine Unloading Facilities	50,000
Subtotal	\$ 1,700,000
<u>Product Improvement</u>	0
<u>Cost Savings</u>	
V-3 Cooling Tower Turbine Replacement (Energy)	\$ 30,000
V-4 Oxychlorination Interchanger (Energy)	65,000
V-5 Timed Tar Still Pumpout	11,000
V-6 Ferric Chloride (FeCl ₃) Addition System	10,000
V-7 In Place Spare S-309	41,000
V-8 Oxychlorination On Stream Analyzer	30,000
V-9 Acetylene Hydrogenator	238,000
Subtotal	\$ 425,000
<u>Pollution Abatement</u>	
V-10 EPA NPDES Water Permit Compliance	\$ 500,000
<u>Safety</u>	
V-11 New Steam Stripper Feed Drum	\$ 65,000
V-12 Chlorine Blowdown Scrubber	15,000
V-13 Plant Breathing Air System	100,000
V-14 Plant Security System	20,000
Subtotal	\$ 200,000
<u>Miscellaneous</u>	
V-15 Critical Equipment Replacement	\$ 80,000
V-16 Laboratory Instruments	27,000
V-17 Maintenance Tools	13,000
V-18 Miscellaneous Items Under \$2,500	25,000
Subtotal	145,000
Total of all Projects	\$ 2,970,000

CWH 000006535

Plant Capital Requirement	
If Item V-1 is Approved (See Note 1)	\$ 2,864,000

Plant Capital Requirement	
If Item V-1 is not Approved (See Note 1)	1,320,000

Memorandum Items

V-1M	EPA NPDES Water Permit Compliance(Potential Requirements)	1,300,000
V-2M	Plant Incinerator	4,000,000
	Total	\$ 5,300,000

Note 1 - Items V-4 and V-7 are not applicable if Item V-1 is approved.
V-4 and V-7 are also part of Item V-1.

CWH 000006536

1975 CAPITAL BUDGET
CASH FLOW ASSUMING APPROVAL OF V-1, M\$

Project Year	0	1	2	3	4	5	6	7	8	9	10
Project											
V-1	(1650.0)	578.4	617.3	584.7	559.4	539.6	524.4	524.4	524.4	514.1	616.0
V-2	(50.0)	13.5	11.9	10.9	10.2	9.6	9.1	9.1	9.1	8.8	10.0
V-3	(30.0)	19.5	18.5	18.0	17.5	17.2	16.9	16.9	16.9	16.7	17.4
V-5	(11.0)	44.4	44.1	43.8	43.6	43.5	43.4	43.4	43.4	43.3	43.1
V-6	(10.0)	16.7	16.4	16.2	16.0	15.9	15.8	15.8	15.8	15.7	16.0
V-8	(30.0)	38.6	37.6	37.0	36.6	36.2	35.9	35.9	35.9	35.8	36.5
V-9	(238.0)	73.9	66.5	61.8	58.1	55.3	53.1	53.1	53.1	53.1	53.6
Subtotal	(2019.0)	785.0	812.3	772.4	741.4	717.3	698.6	698.6	698.6	687.5	792.6
DCF% =	44.6%										
V-10	(500.0)	42.8	27.2	17.4	9.7	3.7	(0.9)	(0.9)	(0.9)	(4.0)	7.8
V-11	(65.0)	5.6	3.5	2.3	1.3	0.5	(0.1)	(0.1)	(0.1)	(0.5)	1.0
V-12	(15.0)	1.3	0.8	0.5	0.3	0.1	0.0	0.0	0.0	(0.1)	0.2
V-13	(100.0)	8.6	5.5	3.5	1.9	0.7	(0.2)	(0.2)	(0.2)	(0.8)	1.6
V-14	(20.0)	1.7	1.1	0.7	0.4	0.1	0.0	0.0	0.0	(0.2)	0.3
V-15	(80.0)	6.8	4.4	2.8	1.6	0.6	(0.1)	(0.1)	(0.1)	(0.6)	1.2
V-16	(27.0)	2.3	1.5	0.9	0.5	0.2	0.0	0.0	0.0	(0.2)	0.4
V-17	(13.0)	1.1	0.7	0.5	0.3	0.1	0.0	0.0	0.0	(0.1)	0.2
V-18	(25.0)	2.1	1.4	0.9	0.5	0.2	0.0	0.0	0.0	(0.2)	0.4
Subtotal	(845.0)	72.3	46.1	29.5	16.5	6.2	(1.3)	(1.3)	(1.3)	(6.7)	13.1
DCF% =	0.0										
Total	(2864.0)	857.3	858.4	801.9	757.9	723.5	697.3	697.3	697.3	680.8	805.7
DCF% =	28.9										

CW 000006537

1975 CAPITAL BUDGET
CASH FLOW SUMMARY ASSUMING V-1 IS NOT APPROVED

Project Year	<u>0</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>
<u>Project</u>											
V-2	(50.0)	13.5	11.9	10.9	10.2	9.6	9.1	9.1	9.1	8.8	10.0
V-3	(30.0)	19.5	18.5	18.0	17.5	17.2	16.9	16.9	16.9	16.7	17.4
V-4	(65.0)	41.1	39.0	37.7	36.7	36.0	35.4	35.4	35.4	34.9	36.4
V-5	(11.0)	44.4	44.1	43.8	43.6	43.5	43.4	43.4	43.4	43.3	43.1
V-6	(10.0)	16.7	16.4	16.2	16.0	15.9	15.8	15.8	15.8	15.7	16.0
V-7	(41.0)	31.1	29.7	28.9	28.3	27.8	27.4	27.4	27.4	27.1	28.2
V-8	(30.0)	38.6	37.6	37.0	36.6	36.2	35.9	35.9	35.9	35.8	36.5
V-9	(238.0)	73.9	66.5	61.8	58.1	55.3	53.1	53.1	53.1	53.1	53.6
Subtotal	(475.0)	278.8	263.7	254.3	247.0	241.5	237.0	237.0	237.0	235.4	241.2
DCF % =	73.2%										
V-10	(500.0)	42.8	27.2	17.4	9.7	3.7	(0.9)	(0.9)	(0.9)	(4.0)	7.8
V-11	(65.0)	5.6	3.5	2.3	1.3	0.5	(0.1)	(0.1)	(0.1)	(0.5)	1.0
V-12	(15.0)	1.3	0.8	0.5	0.3	0.1	0.0	0.0	0.0	(0.1)	0.2
V-13	(100.0)	8.6	5.5	3.5	1.9	0.7	(0.2)	(0.2)	(0.2)	(0.8)	1.6
V-14	(20.0)	1.7	1.1	0.7	0.4	0.1	0.0	0.0	0.0	(0.2)	0.3
V-15	(80.0)	6.8	4.4	2.8	1.6	0.6	(0.1)	(0.1)	(0.1)	(0.6)	1.2
V-16	(27.0)	2.3	1.5	0.9	0.5	0.2	0.0	0.0	0.0	(0.2)	0.4
V-17	(13.0)	1.1	0.7	0.5	0.3	0.1	0.0	0.0	0.0	(0.1)	0.2
V-18	(25.0)	2.1	1.4	0.9	0.5	0.2	0.0	0.0	0.0	(0.2)	0.4
Subtotal	(845.0)	72.3	46.1	29.5	16.5	6.2	(1.3)	(1.3)	(1.3)	(6.7)	13.1
DCF % =	0.0										
Total	(1320.0)	351.1	309.8	283.8	263.5	247.7	235.7	235.7	235.7	228.7	254.3
DCF % =	19.4										

CMH 000006538

1975 CAPITAL BUDGET

Lake Charles VCM Plant

V-1

PHASE II DEBOTTLENECKING

\$1,650,000 Capital $\pm$ 15%
\$ 50,000 Expense

Project Description

These funds are requested for installation of equipment to increase plant production capacity by 20 MM pounds per year. This project will generate annual revenues of \$1,000,000 based upon a gross margin of \$0.05/lb. of VCM as suggested by Marketing. The following equipment revisions will be required:

- 1) Quench/EDC Interchanger and Pumps
- 2) Furnace Feed EDC Heater
- 3) An Additional EDC Furnace Charge Pump
- 4) An Additional Primary Oxychlorination Phase Separator
- 5) A New After Condenser Receiver
- 6) New Heavy Ends Column Feed Pumps
- 7) An Additional Heavy Ends Column Reboiler
- 8) Retraining of the Heavy Ends Column
- 9) Heavy Ends Column Reflux Pumps
- 10) Line and Control Valve Replacement as Required
- 11) HCl Column Revisions to Reduce Entrainment
- 12) An Additional Oxy HCl Feed Heater

The following additions are being made to reduce the refrigeration load:

- 1) The addition of a steam/vacuum refrigeration system
- 2) A larger finishing reactor after condenser
- 3) The addition of an oxy interchanger

In addition to the above equipment modifications, it will be necessary to attain additional oxychlorination capacity through use of BASF catalyst or through export of 30 or 40 tons per day of HCl to the Methyl Chloride Plant.

This project follows a previous 20 MM lbs./year debottlenecking project currently under construction. The Phase II Project will bring plant capacity to 730 MM lbs./yr.

Problem Description

A current debottlenecking project now under construction will increase plant capacity to 710 MM lbs./yr. Present market conditons indicate that production above this level can readily be sold.

CWH 000006539

Alternatives

The only significant alternate to this project is to proceed with a major expansion to 1,015 MM lbs./yr. Approximately \$1.1 MM of the \$1.65 MM investment would not be utilized in the major expansion design.

Project Economics Summary

Under present market conditions the VCM Plant has a gross margin of \$0.05/lb. of VCM produced. On this basis this project generates revenues of \$1,000,000 per year and has a payout period of 3.3 years. The calculated DCF return is 39.7%.

CWH 000005540

CWH 00006541

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PHASE II DEBOTTLENECKING
PROJECT ECONOMICS SENSITIVITY ANALYSIS

Base Case: Capital Commitment	\$1,650,000	DCF Return 39.7%
Sales Tax	\$ 40,000	
Expense	\$ 10,000	

<u>Possible Variances</u>		<u>% DCF Return</u>	
<u>Minus</u>	<u>Plus</u>	<u>Impaired To</u>	<u>Improved To</u>
+25%		Capital Commitment	29.8%
-20%		Revenues (1)	29.4%
-40%		Revenues (2)	18.8%
-60%		Revenues (3)	7.5%

- 1) Corresponds to a gross margin of \$0.04 per pound VCM product.
- 2) Corresponds to a gross margin of \$0.03 per pound VCM product.
- 3) Corresponds to a gross margin of \$0.02 per pound VCM product.

CWH 000006542

PHASE II DEBOTTLENECKING
PROJECT ECONOMIC ASSUMPTIONS

Revenues

- 1) A margin of 5¢/lb. was used. This is the anticipated 1975 margin between the vinyl transfer price and the plant variable cost and is based on information from Marketing personnel.
- 2) Sales were assumed to be 20 MM lbs./yr. of VCM product.

Costs

- 1) Maintenance cost was assumed to be 7.5% of construction capital per year. This maintenance expense is in excess of the normal plant experience of 5% because of the nature of the equipment being installed.
- 2) Taxes and insurance were assumed to be 1.25% of construction capital based upon past plant experience.

Other

- 1) Working capital was taken as the difference in 30 days accounts receivable less accounts payable.
- 2) Salvage value was taken as 5% of construction capital.

CWH 000006543

1975 CAPITAL BUDGET

Lake Charles VCM Plant

V-2

ADDITIONAL LIQUID CHLORINE UNLOADING FACILITIES

\$50,000 Capital $\pm$ 50%

Project Description

This project will provide funds for an additional liquid chlorine tank car unloading spot and associated piping. This facility will be installed to increase the plant's ability to unload liquid chlorine.

Problem Description

Various alternatives are now under study in an effort to secure the VCM Plant's chlorine supply. The purchase of a substantial amount of liquid chlorine is anticipated in the future. The existing plant liquid chlorine unloading facility will only handle a maximum of 40,000 tons per year of liquid chlorine. Additional facilities must be installed to handle any liquid chlorine in excess of the 40,000 tons per year. This project is included at the request of the Purchasing Department who are studying various alternatives of securing chlorine sufficient to supply plant production requirements.

Alternatives

Several alternatives of securing chlorine supply are being considered by the Chemicals' business area. These include:

- 1) Purchase of EDC as a chlorine source.
- 2) Purchase of barge quantities of chlorine with vaporization facilities to be operated by PPG.

Liquid chlorine tank cars are the most undesirable method of bringing chlorine into the VCM Plant from both safety and economic aspects. These facilities will be installed only if no other alternatives are available.

Project Economics Summary

This project can only be justified if the plant is short of chlorine and if liquid chlorine in excess of 40,000 tons per year is anticipated. At a \$0.05 per pound gross margin for VCM product, an incremental input of 110 tons per year will justify the \$50,000 capital with a payout period of 5.9 years and a calculated DCF return of 20%.

Current projections indicate 58,000 tons of chlorine must come from sources other than PPG during 1975. The means used to receive the chlorine will depend upon factors of Marketing and Transportation.

CWH 000006544

ADDITIONAL LIQUID CHLORINE UNLOADING FACILITIES
CALCULATION OF PROJECT ECONOMICS

Project Year	<u>0</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>
Revenues, M\$											
Incremental VCM		16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.7
Costs, M\$											
Maintenance		2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Depreciation		5.6	9.9	7.7	6.0	4.6	3.6	3.6	3.6	2.9	0.0
Insurance & Taxes		0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Taxable Income, M\$		8.0	3.7	5.9	7.6	9.0	10.0	10.0	10.0	10.7	13.6
Income Tax, M\$		3.6	1.7	2.7	3.4	4.0	4.5	4.5	4.5	4.8	6.1
7% Invest. Tax Credit, M\$		3.5									
After Tax Income, M\$		7.9	2.0	3.2	4.2	5.0	5.5	5.5	5.5	5.9	7.5
Depreciation, M\$		5.6	9.9	7.7	6.0	4.6	3.6	3.6	3.6	2.9	0.0
Operating Cash Flow, M\$		13.5	11.9	10.9	10.2	9.6	9.1	9.1	9.1	8.8	7.5
Investment, M\$	(50.0)										
Salvage Value, M\$											2.5
Net Cash Flow, M\$	(50.0)	13.5	11.9	10.9	10.2	9.6	9.1	9.1	9.1	8.8	10.0
DCF, %	20.0%										
Discounted Payout Period, Years	5.9										

CMT 000006545

ADDITIONAL LIQUID CHLORINE UNLOADING FACILITIES

PROJECT ECONOMICS SENSITIVITY ANALYSIS

Base Case: Capital Commitment \$50,000

DCF Return 20.0%

Possible Revenues

% DCF Return

Minus

Plus

Impaired To

Improved To

100% Revenues (1)
200% Revenues (2)
300% Revenues (3)

54.1%
84.5%
>95.0%

Notes: The project economics are dependent on the amount of additional liquid chlorine above 40,000 tons per year that will be supplied.

- 1) Corresponds to 220 tons of liquid chlorine above 40,000 tons per year.
- 2) Corresponds to 330 tons of liquid chlorine above 40,000 tons per year.
- 3) Corresponds to 440 tons of liquid chlorine above 40,000 tons per year.

CWH 000006546

ADDITIONAL LIQUID CHLORINE UNLOADING FACILITIES

PROJECT ECONOMIC ASSUMPTIONS

Revenues

- 1) A gross margin of \$0.05 per pound of VCM was used.
- 2) Plant production was assumed limited by chlorine supply and the standard plant conversion of chlorine to VCM was used.

Costs

- 1) Maintenance cost was assumed to be 5% of construction capital per year.
- 2) Insurance and taxes were assumed to be 1.25% per year of capital investment.

Other

- 1) Salvage value was assumed to be 5% of construction capital.

CWH 000006547

1975 CAPITAL BUDGET

Lake Charles VCM Plant

V-3

COOLING TOWER TURBINE REPLACEMENT (ENERGY)

\$30,000 $\pm$ 15%

Project Description

A new steam turbine will be purchased and installed as a replacement on an existing cooling water pump. The installation of the new turbine will result in more efficient steam usage and a substantial energy savings. Steam turbine power consumption efficiencies indicate steam usage may be decreased by 1,800 lbs./hr. through installation of a more efficient cooling water pump driver.

Problem Description

The plant has two steam turbine driven cooling water pumps, only one of which is normally in service, the other being on a standby basis. The existing Worthington turbines on these 460 h.p. pumps have a design steam consumption of 61.7 lbs./h.p. hour of 600 psig steam.

The replacement turbine being considered will require 57.8 lb./h.p. hour of 600 psig steam. The resultant steam savings of 1,800 lbs./hr. represents a considerable energy savings of 13 billion BTU/yr. This estimate of savings is based on the assumption of the efficient turbine operating 80% of the time during normal plant operations.

Alternatives

No alternatives were considered.

Project Economics Summary

The anticipated steam consumption savings will generate revenues of \$30,800 per year based upon 4th quarter 1974 plant steam costs. The capital expenditure of \$30,000 has a discounted payout period of 1.7 years with a calculated DCF return of 84.9%.

CWH 000006548

COOLING TOWER TURBINE REPLACEMENT
CALCULATION OF PROJECT ECONOMICS

Project Year	<u>0</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>
Revenues, M\$											
Steam Savings		30.8	30.8	30.8	30.8	30.8	30.8	30.8	30.8	30.8	30.8
Costs, M\$											
Maintenance		1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Depreciation		3.3	5.9	4.6	3.6	2.8	2.2	2.2	2.2	1.8	0.0
Insurance & Taxes		0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Taxable Income, M\$		25.6	23.0	24.3	25.3	26.1	26.7	26.7	26.7	27.1	28.9
Income Tax, M\$		11.5	10.4	10.9	11.4	11.7	12.0	12.0	12.0	12.2	13.0
7% Investment Tax Credit, M\$		<u>2.1</u>									
After Tax Income, M\$		16.2	12.6	13.4	13.9	14.4	14.7	14.7	14.7	14.9	15.9
Depreciation, M\$		<u>3.3</u>	<u>5.9</u>	<u>4.6</u>	<u>3.6</u>	<u>2.8</u>	<u>2.2</u>	<u>2.2</u>	<u>2.2</u>	<u>1.8</u>	<u>0.0</u>
Operating Cash Flow, M\$		<u>19.5</u>	<u>18.5</u>	<u>18.0</u>	<u>17.5</u>	<u>17.2</u>	<u>16.9</u>	<u>16.9</u>	<u>16.9</u>	<u>16.7</u>	<u>15.9</u>
Investment, M\$	(30.0)										
Salvage Value, M\$											1.5
Net Cash Flow, M\$	(30.0)	19.5	18.5	18.0	17.5	17.2	16.9	16.9	16.9	16.7	17.4
DCF, %	84.9										
Discounted Payout Period, Years	1.7										

CWH 000006549

COOLING TOWER TURBINE REPLACEMENT
PROJECT ECONOMICS SENSITIVITY ANALYSIS

Base Case: Capital Commitment \$30,000

DCF Return 84.9%

Possible Variances

% DCF Return

Minus Plus

Impaired To

Improved To

+50%

Capital Commitment

55.2%

-50%

Revenues

36.2%

Combination Of Above

20.7%

CWH 000006550

COOLING TOWER TURBINE REPLACEMENT

PROJECT ECONOMICS ASSUMPTIONS

Revenues

- 1) Steam savings of 1794 lbs./hr. The cooling water turbine breaks high pressure steam to a 250 psig level. At current operating conditions, the plant vents in excess of 1,800 lbs./hr. of 250 psig steam. Thus a reduction in steam usage by the cooling water turbine will result in a total plant steam usage reduction of the same magnitude.
- 2) Turbine operation 341 days/year, 80% of the time. The other spare turbine is used the remaining 20% of the 341 operating days.
- 3) A plant steam cost of \$2.623567 per 1,000 lbs. was used. This is the plant's 4th quarter 1974 budgeted steam cost.

Costs

- 1) Maintenance was assumed 5% of construction capital.
- 2) Insurance and taxes were assumed 1.25% of construction capital.

Other

- 1) Salvage value was assumed 5% of construction capital.

CWH 000006551

1975 CAPITAL BUDGET

Lake Charles VCM Plant

V-4

OXYCHLORINATION INTERCHANGER (ENERGY)

\$65,000 Capital $\pm$ 15%

Project Description

A new Karbate crossbore exchanger will be installed in the Oxychlorination section. This heat exchanger will cool the S-306 outlet vapor stream with the S-307 outlet vapor stream. Installation of this exchanger will result in debottlenecking the propylene refrigeration system by approximately 6%. This installation will also result in a substantial steam savings of about 49 MM lbs./yr. high pressure steam. Because of the refrigeration debottlenecking feature of this project, there is a potential increase in plant production.

Problem Description

Under current operating conditions the vapors exiting S-306 enters a refrigerated condenser H-306 and are then cooled to -20°C. The cooled vapors and condensed liquid are then separated in S-307. The vapor exiting S-307 is heated by low pressure steam to ambient temperature by H-310 and then flows to the Oxy vent.

The proposed Oxychlorination interchanger will use the cooled vapors exiting S-307 to precool the vapors entering H-306. This will reduce the refrigeration duty on H-306 which will in turn reduce the propylene refrigeration duty. The propylene refrigeration system is the principle refrigeration supply system in the plant and is driven by a steam turbine. The reduction in duty on the refrigeration system will substantially reduce plant steam consumption. An estimated 6,000 lbs./hr. of high pressure steam can be saved as a result of this project. This project will debottleneck the refrigeration system and may also result in incremental plant capacity during periods when the turbine is fouled. This installation will be part of Phase II Debottlenecking and Item V-4 will not be needed if Item V-1 is approved.

Alternatives

There are no comparative process alternatives to reduce high pressure steam consumption. The principle methods of providing additional refrigeration capacity are upgrading of the existing turbine driven machine and installation of a new separate refrigeration system. The feasibility of upgrading the existing machine is under study by Elliott, the machine vendor. The installation of a separate new refrigeration system would be far more costly.

Project Economics Summary

Process calculations indicate a potential steam savings of 6,000 lbs./hr. of high pressure steam can be achieved through installation of this project. Because of uncertainties in the plant steam balance, a savings of 3,000 lbs./hr. was assumed for the project. This anticipated steam consumption savings will generate yearly

V-4
Page 2

revenues of \$64,400 based upon 4th quarter 1974 budgeted steam costs. The capital expenditure of \$65,000 has a discounted payout period of 1.8 years with a calculated DCF return of 84.2%.

CWH 000006553

OXYCHLORINATION INTERCHANGER
CALCULATION OF PROJECT ECONOMICS

Project Year	<u>0</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>
Revenues, M\$											
Steam Savings		64.4	64.4	64.4	64.4	64.4	64.4	64.4	64.4	64.4	64.4
Costs, M\$											
Maintenance		3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
Depreciation		7.2	12.8	10.0	7.8	6.0	4.7	4.7	4.7	3.8	0.0
Insurance & Taxes		0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Taxable Income, M\$		53.2	47.6	50.4	52.6	54.4	55.7	55.7	55.7	56.6	60.4
Income Tax, M\$		23.9	21.4	22.7	23.7	24.4	25.0	25.0	25.0	25.4	27.2
7% Investment Tax Credit, M\$		4.6									
After Tax Income, M\$		33.9	26.2	27.7	28.9	30.0	30.7	30.7	30.7	31.1	33.2
Depreciation, M\$		7.2	12.8	10.0	7.8	6.0	4.7	4.7	4.7	3.8	0.0
Operating Cash Flow, M\$		41.1	39.0	37.7	36.7	36.0	35.4	35.4	35.4	34.9	33.2
Investment, M\$	(65.0)										
Salvage Value, M\$											3.2
Net Cash Flow, M\$	(65.0)	41.1	39.0	37.7	36.7	36.0	35.4	35.4	35.4	34.9	36.4
DCF %	84.2										
Discounted Payout Period, Years	1.8										

W5590000 HMD

OXYCHLORINATION INTERCHANGER
PROJECT ECONOMICS SENSITIVITY ANALYSIS

Base Case: Capital Commitment \$65,000

DCF Return 84.2%

Possible Variances

% DCF Return

<u>Minus</u>	<u>Plus</u>		<u>Impaired To</u>	<u>Improved To</u>
+50%		Capital Commitment	64.3%	
	+50%	Revenues		>95%
-50%		Revenues	34.6%	
-70%		Revenues	16.4%	

CWH 000006555

OXYCHLORINATION INTERCHANGER

PROJECT ECONOMICS ASSUMPTIONS

Revenues

- 1) The potential steam savings available was determined to be 6,000 lbs./hr.
- 2) Uncertainties in the plant steam balance exist and it is unlikely the full 6,000 lbs./hr. savings can be achieved. Present indications are that a savings of 3,000 lbs./hr. is realistic. This magnitude of savings was assumed for the economics. This will represent a true steam consumption savings as further 150 psig makeup from the 600 psig system will not be necessary at the 3,000 lbs./hr. savings level.
- 3) Operation of the interchanger as a steam savings device 341 days/year.
- 4) Steam cost of \$2.623567/M lbs. This is the plant's 4th quarter 1974 budgeted steam cost.

Costs

- 1) Maintenance--assumed 5% of construction capital.
- 2) Insurance and Taxes--assumed 1.25% of construction capital.

Other

- 1) Salvage Value--assumed 5% of construction capital.

CWH 000006556

1975 CAPITAL BUDGET

Lake Charles VCM Plant

V-5

TIMED TAR STILL PUMPOUT

\$11,000 Capital $\pm$ 15%

Project Description

The purpose of this project is to recover an estimated 1.4 MM lbs./yr. of EDC now disposed of in "tars." This will also reduce total tars make by 1.4 MM lbs./yr.

This project proposes to purchase and install new 30 gpm "Moyno" pumps on both the EDC and vinyl tar stills. The pumps will be automatically activated by motor timers to pump out the stills for a set number of minutes each hour. The existing tar still pumps will remain in place as spares.

Problem Description

Presently, both EDC and vinyl tar stills are pumped out batchwise at 70 gpm. The EDC stills must be pumped once per day and the vinyl stills about three times per week. EDC content of the "tars" averages about 15%, which is not only a product loss but a disposal expense as well.

A series of samples taken during the course of EDC tar still pumpouts shows that for the first 30 minutes EDC content is below 8%. At the end of one hour the EDC is 18-20%. With the proposed timed pumping system, the EDC stills will be pumped for about 6 minutes each hour and the vinyl stills for about 2 minutes each hour.

At the present time we pay PPG \$30/ton to dispose of "tars." By reducing the tars EDC content we will also reduce the yearly cost of tars disposal. Our contract with PPG specifies that the total EDC plus 1,1,2 trichloroethane be 40% minimum. We can meet this requirement with as little as 6% EDC in the tars.

KemaNord has installed a timed tars pumpout system. They claim an additional benefit of more stable column and still operation.

Alternatives

A continuous pumpout system was considered but was rejected as unreliable, due to the small flow rates involved.

Project Economics Summary

Savings of \$79,000 per year are estimated for this project. Capital investment is estimated at \$11,000. DCF return is >95%.

CWH 000006557

TIMED TAR STILL PUMPOUT
CALCULATION OF PROJECT ECONOMICS

Project Year	<u>0</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>
Revenues, M\$											
EDC Recovery		58.2	58.2	58.2	58.2	58.2	58.2	58.2	58.2	58.2	58.2
Tars Disposal Savings		21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0
Total		<u>79.2</u>	<u>79.2</u>	<u>79.2</u>	<u>79.2</u>	<u>79.2</u>	<u>79.2</u>	<u>79.2</u>	<u>79.2</u>	<u>79.2</u>	<u>79.2</u>
Costs, M\$											
Maintenance & Operations		0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Insurance & Taxes		0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Depreciation		1.2	2.2	1.7	1.3	1.0	0.8	0.8	0.8	0.6	0
Taxable Income, M\$		77.1	76.1	76.6	77.0	77.3	77.5	77.5	77.5	77.7	78.3
Income Tax, M\$		33.9	34.2	34.5	34.7	34.8	34.9	34.9	34.9	35.0	35.2
After Tax Income, M\$		43.2	41.9	42.1	42.3	42.5	42.6	42.6	42.6	42.7	43.1
Depreciation, M\$		1.2	2.2	1.7	1.3	1.0	0.8	0.8	0.8	0.6	0
Operating Cash Flow, M\$		44.4	44.1	43.8	43.6	43.5	43.4	43.4	43.4	43.3	43.1
Investment, M\$	(11.0)										
Salvage Value, M\$											0.5
Net Cash Flow, M\$	(11.0)	44.4	44.1	43.8	43.6	43.5	43.4	43.4	43.4	43.3	43.6
DCF Return	>95%										
Discounted Payout Period, Years	<1 Yr.										

CWH 000006558

TIMED TAR STILL PUMPOUT
PROJECT ECONOMICS SENSITIVITY ANALYSIS

Base Case: Capital Commitment \$11,000

DCF Return >95%

Possible Variances

Minus Plus

% DCF Return

Impaired To

Improved To

+80%

Capital Commitment >95

-20%

Tars Make >95

-50%

EDC Recovery >95

See Note (1)

Combination >95

- 1) Combination of -60% in EDC recovery and +80% in capital commitment.

TIMED TAR STILL PUMPOUT
PROJECT ECONOMICS ASSUMPTIONS

Revenues

- 1) Tars production of 18.45 MM lbs./yr., based on 700 MM lbs./yr. VCM production and 1974 standards.
- 2) EDC content of tars = 15% (1973 avg. = 17%).
- 3) EDC content of tars with timed pumpout is reduced to 8%. Increased EDC recovery = 1.4 MM lbs./yr.
- 4) EDC considered as worth 1974 4th quarter budgeted variable cost of 4.16 ¢/lb.
- 5) No escalation in EDC value over life of project.
- 6) Tar disposal costs 1.5 ¢/lb. based on present contract. No escalation.

Costs

- 1) Maintenance--taken as 6% of capital investment rather than 5% as pumps in this service will require more than normal maintenance.
- 2) Operating Costs--no change from present.
- 3) Insurance and Taxes--taken as 1.25% of capital investment.

Other

Salvage Value--taken as 5% of capital investment.

1975 CAPITAL BUDGET

Lake Charles VCM Plant

V-6

FERRIC CHLORIDE (FeCl_3) ADDITION SYSTEM

\$10,000 Capital $\pm$ 25%

Project Description

This item will provide funds for installation of a catalyst addition system to supply FeCl_3 catalyst to the direct chlorination reactor. The catalyst addition system will consist of an injection drum and the associated piping and instrumentation facilities for the safe and trouble-free addition of the catalyst. The proposed catalyst addition system has the potential of reducing tars production by 2.8 MM pounds per year.

Problem Description

Operating information from Stauffer licensees BASF and Sumitomo has shown formation of 1,1,2 trichloroethane decreases with increased FeCl_3 concentration in the R-101 direct chlorination reactor. In our VCM Plant no positive method to control FeCl_3 exists. The FeCl_3 in the reactor results from corrosion within the reactor and within the chlorine pipeline. Typically this concentration is about 20 ppm. The licensee information indicated if this concentration were increased to 70 ppm, the formation of 1, 1, 2 trichloroethane would be reduced by 80%. This would decrease plant tar production by 2.8 MM pounds per year.

The plant currently disposes of tars at a cost of \$30 per ton to PPG on a contract that extends until 1978. The method of tar disposal after 1978 has not been determined and contingency methods to reduce tar production must be developed. At present a reduction of 1,1,2 trichloroethane production by 2.8 MM pounds per year may not be possible without jeopardizing our PPG position due to a contractual commitment based on a minimum content of 1,1,2 trichloroethane and EDC in the tars. However, this project offers a very promising possibility of substantially reducing tar production after the 1978 contract period, and may reduce their production short term. The installation of this project would be delayed until after a satisfactory test to demonstrate its potential was performed.

Alternatives

No alternatives were considered.

Project Economics Summary

This project will generate revenues of \$42,700 per year and will have a \$14,000 per year variable cost for FeCl_3 catalyst. The \$10,000 investment for this item has a payout period of 0.6 years and has a calculated DCF return of greater than 95%.

CWH 000006561

FeCl₃ ADDITION SYSTEM
CALCULATION OF PROJECT ECONOMICS

Project Year	<u>0</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>
Revenues, M\$											
Decreased Tars Disposal		42.7	42.7	42.7	42.7	42.7	42.7	42.7	42.7	42.7	42.7
Costs, M\$											
Catalyst		14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0
Maintenance		.5	.5	.5	.5	.5	.5	.5	.5	.5	.5
Depreciation		1.1	2.0	1.5	1.2	.9	.7	.7	.7	.6	.0
Insurance & Taxes		.1	.1	.1	.1	.1	.1	.1	.1	.1	.1
Taxable Income, M\$		27.0	26.1	26.6	26.9	27.2	27.4	27.4	27.4	27.5	28.1
Income Tax, M\$		12.1	11.7	11.9	12.1	12.2	12.3	12.3	12.3	12.4	12.6
7% Investment Tax Credit		<u>.7</u>									
After Tax Income, M\$		15.6	14.4	14.7	14.8	15.0	15.1	15.1	15.1	15.1	15.5
Depreciation, M\$		<u>1.1</u>	<u>2.0</u>	<u>1.5</u>	<u>1.2</u>	<u>.9</u>	<u>.7</u>	<u>.7</u>	<u>.7</u>	<u>.6</u>	<u>.0</u>
Operating Cash Flow, M\$		16.7	16.4	16.2	16.0	15.9	15.8	15.8	15.8	15.7	15.5
Investment, M\$	(10.0)										
Salvage Value, M\$											0.5
Net Cash Flow, M\$	(10.0)	16.7	16.4	16.2	16.0	15.9	15.8	15.8	15.8	15.7	16.0
DCF %	>95%										
Discounted Payout Period, Years	0.6										

CUH 000006562

FeCl₃ ADDITION SYSTEM
PROJECT ECONOMICS SENSITIVITY ANALYSIS

Base Case: Capital Commitment \$10,000

DCF Return >95%

<u>Possible Variances</u>		<u>% DCF Return</u>	
<u>Minus</u>	<u>Plus</u>	<u>Impaired To</u>	<u>Improved To</u>
+50%		Capital Commitment	> 95%
-50%		Revenues	59.2%
-60%		Revenues	16.7%

CWH 000006563

FeCl₃ ADDITION SYSTEM
PROJECT ECONOMIC ASSUMPTIONS

Revenues

- 1) Based upon Stauffer licensee information from BASF and Sumitomo, a decrease of 80% in 1,1,2 trichloroethane amount in the stream exiting R-101 was used. This is equivalent to a reduction in tars production of 2.8 MM lbs. per year.
- 2) It was assumed that the decrease in 1,1,2 formation was reflected in a direct decrease in tars production. A tars disposal cost of \$30 per ton was used.

Costs

- 1) A catalyst cost of \$10,000 per year was determined based upon calculated consumption and an escalated FeCl₃ price.
- 2) Maintenance cost was assumed to be 5% of construction capital.
- 3) Taxes and insurance was assumed to be 1.25% of construction capital.

Other

- 1) A salvage value of 5% of construction capital was used.

CWH 000006564

1975 CAPITAL BUDGET

Lake Charles VCM Plant

V-7

IN PLACE SPARE S-309

\$41,000 Capital $\pm$ 15%

Project Description

An existing spare S-309 vessel with its associated piping will be installed in the process area. S-309 is the primary separator in the Oxychlorination Section and this glass lined vessel is critical to operation. The installed spare vessel will not be in continuous service as blinds will be installed at the interconnecting piping tie-ins. This installation will permit a rapid switch to operation with the spare vessel in the event of an S-309 vessel failure with a resultant savings in lost production downtime. A lost production downtime savings average of 1 MM lb./year will result from this project. The installation of a parallel on-stream S-309 is part of Phase II Debottlenecking, Item V-1. If Item V-1 is approved, Item V-7 is not applicable.

Problem Description

During the six years of plant operation, the S-309 vessel has incurred a major failure requiring its removal from plant operation on two occasions. When this occurs the plant must be shut down until the defective vessel is removed and replaced with an existing spare vessel. The downtime required to remove the vessel, replace it and connect the required piping and instrumentation is three days. The resulting production loss is 6.1 MM pounds of VCM. The proposed installation of a spare vessel in the process will permit the spare vessel to be in operation within 12 hours of an S-309 failure with a VCM production loss reduction to 1.1 MM pounds. It is anticipated that an in place spare S-309 will result in a 5.0 MM pound VCM production savings once every five years.

In the event of a minor failure in S-309, a tantalum patch is used to seal the failure. These repairs normally require 18-24 hours of downtime. The installation of this project will reduce this source of downtime.

Alternatives

No alternatives were considered.

Project Economics Summary

Installation of the existing spare S-309 vessel as an in place spare will generate an average revenue of \$50,000 per year based upon a gross margin of \$0.05 per pound VCM. The capital expenditure of \$41,000 has a discounted payout period of 1.4 years with a calculated discounted cash flow return of greater than 95%.

CWH 000006565

IN PLACE SPARE S-309
CALCULATION OF PROJECT ECONOMICS

Project Year	<u>0</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>
Revenues, M\$											
Savings In Production Loss		50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
Costs, M\$											
Maintenance		2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Depreciation		4.6	8.1	6.3	4.9	3.8	3.0	3.0	3.0	2.4	0.0
Insurance & Taxes		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Taxable Income, M\$		42.8	39.3	41.1	42.5	43.6	44.4	44.4	44.4	45.0	47.4
Income Tax, M\$		19.3	17.7	18.5	19.1	19.6	20.0	20.0	20.0	20.3	21.3
Investment Tax Credit, M\$		<u>3.0</u>									
After Tax Income, M\$		26.5	21.6	22.6	23.4	24.0	24.4	24.4	24.4	24.7	26.1
Depreciation, M\$		<u>4.6</u>	<u>8.1</u>	<u>6.3</u>	<u>4.9</u>	<u>3.8</u>	<u>3.0</u>	<u>3.0</u>	<u>3.0</u>	<u>2.4</u>	<u>0.0</u>
Operating Cash Flow, M\$		31.1	29.7	28.9	28.3	27.8	27.4	27.4	27.4	27.1	26.1
Investment, M\$	(41.0)										
Salvage Value, M\$											2.1
Net Cash Flow, M\$	(41.0)	31.1	29.7	28.9	28.3	27.8	27.4	27.4	27.4	27.1	28.2
DCF %	>95%										
Discounted Payout Period, Years	1.4										

CWH 000006566

IN PLACE SPARE S-309

PROJECT ECONOMICS SENSITIVITY ANALYSIS

Base Case: Capital Commitment \$41,000

DCF Return >95%

Possible Variances

% DCF Return

Minus

Plus

Impaired To

Improved To

+50%

+66%

Capital Commitment 64.7%

Revenues

>95%

-20%

Revenues

84.7%

CWH 000006567

IN PLACE SPARE S-309

PROJECT ECONOMIC ASSUMPTIONS

Revenues

- 1) A major vessel failure necessitating removal from service occurs once every five years.
- 2) Vessel removal and replacement takes 72 hours. Vessel purging and inspection take 12 hours. Production credit taken for 60 hours every five years or 12 hours per year.
- 3) VCM production rate of 2 MM lbs./day at a VCM gross margin of \$0.05 per pound.

Costs

- 1) Maintenance--assumed 5% of construction capital.
- 2) Insurance and Taxes--assumed 1.25% of construction capital.

Other

- 1) Salvage Value--assumed 5% of construction capital.

1975 CAPITAL BUDGET

Lake Charles VCM Plant

V-8

OXYCHLORINATION ON-STREAM ANALYZER

\$30,000 Capital + 15%

Project Description

- 1) An on-stream process gas chromatograph will be installed to monitor reaction progress through the primary oxychlorination reactors. One analyzer with stream switching capability will analyze the outlets of R-301, R-302, and R-303.
- 2) A control room board mounted recorder will be installed to monitor reactor performance.

Problem Description

Presently the primary oxy reactors are controlled by monitoring unconverted acid strength and oxychlorination vent percent ethylene. Hot spot temperatures and steam make are used to adjust air splits between individual reactors to control reaction progress. There are only four thermowell tubes in each reactor of 5820 tubes. Because of flow differences these tubes give at best only a rough indication of reaction progress. Steam make readings because of variation in flow instruments between each reactor are again at best only a rough indication of reaction progress.

The on-stream analyzer will provide an accurate overall picture of reaction progress enabling adjustment of air flows to each reactor to optimize reactor efficiency, minimize byproduct formation, and prolong catalyst life. In addition, this analyzer will provide valuable data on the oxychlorination process, assist in reactor stabilization during startup and will be of particular importance if a switch to BASF catalyst is made. There is also a strong potential for reduction of by-products.

Alternatives

Besides the chosen project, other possible alternatives which might provide a solution to the problem were considered and rejected. These alternatives include:

- 1) Addition of thermowell tubes - While providing more data, these would not show overall reactor effectiveness.
- 2) Sample taps for lab analysis - Because of sample condensation and further reaction due to time delays, reliable laboratory analysis is not possible.

CWH 000006569

Project Economics Summary

Savings of \$68,500 per year are expected if catalyst runs can be increased by 7 days due to increased reactor effectiveness. This expenditure has a discounted payout period of 0.8 years with an 10 year DCF return of greater than 95%. Reductions of 5% and 10% in by-products of ethyl chloride and carbon oxides, respectively, will result in annual savings of \$18,750.

CWH 000006570

OXYCHLORINATION ON-STREAM ANALYZER

CALCULATION OF PROJECT ECONOMICS

Project Year	<u>0</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>
Revenues, M\$	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5	68.5
Costs, M\$											
Maintenance	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Ins. & Taxes	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Depreciation	3.3	5.9	4.6	3.6	2.8	2.2	2.2	2.2	2.2	1.8	0
Taxable Income, M\$	60.3	57.7	59.0	60.0	60.8	61.4	61.4	61.4	61.4	61.8	63.3
Income Tax, M\$	27.1	26.0	26.6	27.0	27.4	27.7	27.7	27.7	27.7	27.8	28.6
7 % Invest. Tax Credit	<u>2.1</u>										
After Tax Income, M\$	35.3	31.7	32.4	33.0	33.4	33.7	33.7	33.7	33.7	34.0	35.0
Depreciation, M\$	<u>3.3</u>	<u>5.9</u>	<u>4.6</u>	<u>3.6</u>	<u>2.8</u>	<u>2.2</u>	<u>2.2</u>	<u>2.2</u>	<u>2.2</u>	<u>1.8</u>	<u>0</u>
Operating Cash Flow, M\$	38.6	37.6	37.0	36.6	36.2	35.9	35.9	35.9	35.9	35.8	35.0
Investment, M\$	(30)										
Salvage Value, M\$											1.5
Net Cash Flow, M\$	(30)	38.6	37.6	37.0	36.6	36.2	35.9	35.9	35.9	35.8	36.5
DCF Return, %	>95										
Discounted Payout Period, Yrs.	0.8										

CMH 000006571

OXYCHLORINATION ON-STREAM ANALYZER
PROJECT ECONOMICS SENSITIVITY ANALYSIS

Base Case: Capital Commitment: \$30,000

DCF Return: >95%

Possible Variances

% DCF Return

<u>Minus</u>	<u>Plus</u>		<u>Impaired To</u>	<u>Improved To</u>
5%	0	a) Ethyl Chloride Production	>95%	>95%
5%	0	b) Reaction Overburning	>95%	>95%
70%	0	c) Increased Run Time Between Catalyst Changeouts	41%	>95%

- a) Reduction of by-product ethyl chloride by 190,000 pounds will result in \$13,700 savings per year as chlorine and ethylene (valued at \$0.0325 per pound and \$0.12 per pound respectively).
- b) Reduction of reaction overburning will result in ethylene savings of \$15,000 per year.
- c) Increased run time of only two days versus seven-day base case (valued at \$20,000).

CWH 000006572

OXYCHLORINATION ON-STREAM ANALYZER
PROJECT ECONOMICS ASSUMPTIONS

Revenues

- 1) Increase run time between turnarounds by 7 days, thereby increasing overall plant stream factors.

Case I

Base

Run Time	240 days	$\frac{240}{255}$	X 365 = 343.529 Stream days per year
T/A Time	$\frac{15 \text{ days}}{255 \text{ days}}$		

Case II

7 Day Run time Increase

Run Time	247 days	$\frac{247}{262}$	X 365 = 344.103 Stream days per year
T/A Time	$\frac{15 \text{ days}}{262 \text{ days}}$		

Increased Production = $(344.103 - 343.529) \times 2.1 \text{ MM lbs/day}$
 $= 0.574 \times 2.1 \text{ MM}$
 $= 1,205,400 \text{ lbs/year}$

Increased Production Value (\$0.05/lb.) = \$60,270

- 2) Turnaround per Run Period Cost Savings

Turnaround Cost	\$300,000
Total Time	255 Days
Turnaround Cost per Day	\$1,180
Total Turnaround Savings =	$7 \times 1,180 = \$8,260$

Costs

- 1) Maintenance - Assume 15% of Construction Capital per year because of nature of equipment.
- 2) Insurance and Taxes - Assume 1.25% of Construction Capital. (Plant Experience)

Other

- 1) Salvage Value - Assume 5% of Construction Capital.

1974 CAPITAL BUDGET

Lake Charles VCM Plant

V-9

ACETYLENE HYDROGENATOR

\$163,000 Capital $\pm$ 15%
75,000 License Fee
\$238,000

Project Description

This project consists of a reactor that will hydrogenate the acetylene in the HCl feed to Oxy. The reactor will be licensed from and designed by B. F. Goodrich Chemical Company, who utilize this process in all of their own and licensees' plants. This process has never been combined with a Stauffer Oxy Unit and to that extent, is somewhat speculative. However, the principle is well established and should apply equally well to a Stauffer unit. The license fee is estimated at \$75,000.

Hydrogen for the process will be byproduct hydrogen from the Ethylene Plant. Although most acetylene will be removed from the HCl, the presence of ethane and ethylene products will not enhance its value as a methyl chloride feedstock.

Problem Description

Acetylene is formed as a by-product in the cracking furnaces. It then goes into the Oxy reactors with the HCl from cracking. In Oxy it reacts to form cis and trans dichloroethylene, trichloroethylene, perchloroethylene, and tetrachloroethane. These reactions consume an estimated 2.91 MM pounds per year of HCl that would otherwise be reacted to form EDC. The by-products end up in the waste streams and must be disposed of. It is estimated that the tars will be reduced by 906 tons per year and light ends by 1,120 tons per year.

When Cl₂ is in short supply, the HCl reacting to form by-products reduces vinyl production. The HCl recovered would yield 4.5 MM lbs. of incremental vinyl production.

Alternatives

No alternatives were considered.

Project Economics Summary

Revenues of \$130,000 per year are estimated for the project. The investment of \$163,000 construction capital and \$75,000 licensing fee has a 4.5-year discounted payout period with a 10-year DCF return of 26.8%.

CWH 000006574

ACETYLENE HYDROGENATOR
CALCULATION OF PROJECT ECONOMICS

Project Year	<u>0</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>
Revenues, M\$											
HCl Savings		92.0	92.0	92.0	92.0	92.0	92.0	92.0	92.0	92.0	92.0
Tars Disposal Savings		27.0	27.0	27.0	27.0	27.0	27.0	27.0	27.0	27.0	27.0
EDC in Tars Savings		17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0
EDC in Light Ends Savings		10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Light Ends Lost		(16.0)	(16.0)	(16.0)	(16.0)	(16.0)	(16.0)	(16.0)	(16.0)	(16.0)	(16.0)
Total		<u>130.0</u>	<u>130.0</u>	<u>130.0</u>	<u>130.0</u>	<u>130.0</u>	<u>130.0</u>	<u>130.0</u>	<u>130.0</u>	<u>130.0</u>	<u>130.0</u>
Costs, M\$											
Catalyst		34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0	34.0
Hydrogen		3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Maintenance		8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1
Insurance & Taxes		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Depreciation		26.4	47.0	36.6	28.4	22.1	17.2	17.2	17.2	17.2	0.5
Total		<u>74.0</u>	<u>94.6</u>	<u>82.4</u>	<u>76.0</u>	<u>69.7</u>	<u>64.8</u>	<u>64.8</u>	<u>64.8</u>	<u>64.8</u>	<u>48.1</u>
Taxable Income, M\$		56.0	35.4	45.8	54.0	60.3	65.2	65.2	65.2	65.2	81.9
Income Tax, M\$		25.2	15.9	20.6	24.3	27.1	29.3	29.3	29.3	29.3	36.9
7% Investment Tax Credit, M\$		16.7									
After Tax Income, M\$		<u>47.5</u>	<u>19.5</u>	<u>25.2</u>	<u>29.7</u>	<u>33.2</u>	<u>35.9</u>	<u>35.9</u>	<u>35.9</u>	<u>35.9</u>	<u>45.0</u>
Depreciation, M\$		26.4	47.0	36.6	28.4	22.1	17.2	17.2	17.2	17.2	0.5
Operating Cash Flow, M\$		<u>73.9</u>	<u>66.5</u>	<u>61.8</u>	<u>58.1</u>	<u>55.3</u>	<u>53.1</u>	<u>53.1</u>	<u>53.1</u>	<u>53.1</u>	<u>45.5</u>
Investment, M\$											
Capital	(163.0)										
Licensing	(75.0)										
Salvage Value, M\$											8.1
Net Cash Flow, M\$	(238.0)	73.9	66.5	61.8	58.1	55.3	53.1	53.1	53.1	53.1	53.6
DCF Return =	26.8%										
Discounted Payout Period	4.5 Years										

CWH 000006575

ACETYLENE HYDROGENATOR
PROJECT ECONOMICS SENSITIVITY ANALYSIS

Base Case: Commitment: \$238,000

DCF Return = 26.8%

Possible Variances

		<u>% DCF Return</u>	
<u>Minus</u>	<u>Plus</u>	<u>Impaired To</u>	<u>Improved To</u>
0	20%	20.8	-
20%	0	16.6	-

Capital Commitment
Revenue

CWH 000006576

ACETYLENE HYDROGENATOR
PROJECT ECONOMICS ASSUMPTIONS

General

HCl and EDC costs were obtained by adjusting fourth quarter 1974 standards to reflect a chlorine cost of \$65/ton and an ethylene cost of 12 ¢/lb. The chlorine cost is the average cost now contracted in 1975 plus a 20% escalation. The ethylene cost is that from highest contract for 1975. These figures were supplied by the Olefins Business Area.

Revenues

- 1) HCl savings. It was estimated that 3.645 pounds of HCl react to form by-products per pound of acetylene in the HCl feed to Oxy. This amounts to an annual savings of 2.91 MM pounds per year of HCl. Acetylene was taken as 2,700 ppm in the HCl feed (plant experience). HCl valued at 3.1609 ¢/lb.
- 2) Tars Disposal Savings. Tars disposal costs \$30 per ton under present contract with PPG. It is estimated that the installation of this project will reduce tars production by 906 tons per year.
- 3) EDC in Tars Savings. There is approximately 15% EDC in the tars. The reduction by 906 tons per year in tar production results in a 272 M pound reduction in EDC losses. EDC valued at 6.2593 ¢/lb.
- 4) Light Ends Loss. The removal of acetylene results in a 2.24 MM pound per year reduction in the formation of light ends by-product. At present netback of 0.72 ¢/lb., this results in a revenue loss of \$16,000 per year.
- 5) EDC in Light Ends. At a 7% concentration of EDC in light ends, EDC losses are reduced by 157 M pounds per year.

Costs

- 1) Maintenance--Assumed as 5% of construction capital.*
- 2) Taxes and Insurance--Assumed as 1.25% of construction capital.*
- 3) Hydrogen assumed constant at 2.05 ¢/lb.
- 4) A \$75,000 licensing fee is included in the capital investment. No running royalty is required.
- 5) Catalyst. Cost of \$34,000 per year based on B. F. Goodrich guaranteed consumption rate and price of \$150.00 per cubic foot.

Other

- 1) Salvage Value--Assumed as 5% of construction capital.*

* Construction capital does not include licensing fee.

1975 CAPITAL BUDGET

Lake Charles VCM Plant

V-10

ENVIRONMENTAL PROTECTION AGENCY NPDES WATER

\$500,000 Capital + 25%

PERMIT COMPLIANCE

Project Description

The following items are now being considered to bring the plant's effluent water into compliance with the probable Environmental Protection Agency final National Pollutant Discharge Elimination System (NPDES) permit conditions. The capital requirements are preliminary estimates and will be further defined as the permit conditions, scope and processes of this item are finalized.

1) Secondary System Modifications

- A. Installation of a wall in the north basin to reduce residence time in that basin to the optimum level as indicated by R & D pilot test data. Estimated Capital \$25,000.
- B. Installation of a separate drainage ditch to by-pass storm water around the secondary treating system and eliminate the upsets caused by rapid changes in flowrate, pollutant concentrations and salinity. Estimated Capital \$65,000.
- C. Installation of six non-aerating mixers in the south basin and the equalization basin. This will allow use of these two basins as increased equalization steps to stabilize the raw waste water feed to the north activated sludge basin. Non-aerating mixers are necessary because existing aerators will allow biological growth in the south and equalization basins. This will increase the activated residence time in the entire secondary system beyond the R & D pilot tests optimum levels. Estimated Capital \$60,000.

2) Effluent Suspended Solids Removal

Installation of a dissolved air flotation unit to lower the suspended solids discharge level from the secondary system to less than 316 pounds per day. Estimated Capital \$350,000.

Problem Description

Best Practicable Control Technology Currently Available (BPCTCA) Standards for VCM plants were published in the Federal Register and will be required in 1977. These standards were used by the EPA to set the Draft NPDES permit conditions which will be in effect 7-1-76. It is the plant's opinion that the factors used by the EPA to develop the 1977 BPCTCA Standards are fundamentally different from the factors which characterize the VCM Plant's waste water.

CWH 000006579

The initial EPA Draft NPDES Water Discharge Permit requires that the plant's effluent water meet the following conditions after July 1, 1976. Present (1974) discharge conditions of the plant's effluent are shown for comparison.

COMPARISON OF DRAFT NPDES PERMIT CONDITIONS
WITH 1974 ACTUAL DISCHARGE CONDITIONS

	<u>BOD₅^a</u>	<u>TSS^b</u>	<u>Chrome^c</u>	<u>R-Cl's^d</u>
<u>Pounds Per Day - Average</u>				
Draft Permit - After 7-1-76	209	316	0.25 ppm	72
1974 Operation	2940	1720	3.4 ppm	1248
<u>Pounds Per Day - Maximum</u>				
Draft Permit - After 7-1-76	468	720	0.5 ppm	144
1974 Range	Nil-7919	333-4685	Nil-6.0 ppm	Nil-3303

^aBOD₅ - 5' Day Biological Oxygen Demand

^bTSS - Total Suspended Solids

^cChrome - Parts Per Million By Weight
After 7-1-76 Water Leaving A Chromate Removal System Must Meet The Specified Levels.

^dR-Cl's - Chlorinated Hydrocarbons Calculated As 1,2 - Dichloroethane

It is the plant's opinion that meeting these requirements will require carbon adsorption of the plant's effluent water. Carbon adsorption is commonly thought of as tertiary treatment and therefore should not be applied as BPCTCA. The VCM Plant will seek revised NPDES permit conditions to reflect BPCTCA without carbon adsorption.

Following installation of items 1 and 2 of the Project Description, the VCM Plant should have pollution control capabilities commensurate with BPCTCA.

Should all appeals to revise the VCM Plant's NPDES Permit requirements fail, item V-1M "Environmental Protection Agency NPDES Water Permit Compliance" (Potential Requirements) may be necessary.

Alternatives

- 1) An alternative to the air flotation suspended solids removal system is a granular media filtration system. Tests will be conducted on all alternatives prior to final process selection.

Project Economic Summary

No project economics were determined. This project is being installed solely for pollution control and has no costs savings.

1975 CAPITAL BUDGET

Lake Charles VCM Plant

V-11

NEW STEAM STRIPPER FEED DRUM

\$65,000 Capital ± 15%

Project Description

Purchase and install an 8 foot diameter by 10 foot glass lined agitated carbon steel vessel to replace T-252 pit as process water feed tank to steam stripper C-101. The new vessel must be located in the T-252 pit to allow gravity feed from caustic separator drum T-102. The existing stripper feed pumps will be relocated in the T-252 pit.

A 3 inch sump eductor is provided to remove rain water and spillage from the pit. The new vessel will be tied into the existing wet vent header.

Problem Description

Existing pit T-252 serves as process water collector for the plant. Water from the pit, containing chlorinated hydrocarbons, is fed to steam stripper C-101 for organics removal prior to being discharged to the neutralization pit.

T-252 was originally an open pit, but has since been fitted with a concrete cover. A large amount of EDC fumes (and occasionally VCM vapor) are vented into the Block I area from this pit. The pit cannot be pressurized, thus preventing it from being tied into the plant vent header.

This project will replace T-252 with a glass lined, agitated tank which can be vented to the existing plant wet vent header.

Alternatives

No alternatives were calculated.

Project Economics Summary

No economics were calculated as this project is solely for reduction of personnel exposure to chlorinated organic vapor.

CWH 000006581

1975 CAPITAL BUDGET

Lake Charles VCM Plant

V-12

CHLORINE BLOWDOWN SCRUBBER

\$15,000 Capital $\pm$ 25%

Project Description

Funds are requested for a circulating caustic scrubber to absorb chlorine vapors during line purging and maintenance. Currently, there are no adequate facilities to contain these vapors. After installation of the proposed system the vapors will be removed via reaction with the caustic solution.

Problem Description

Periodic maintenance is required on the chlorine compressor and its associated piping and on the liquid chlorine unloading facilities. To perform this maintenance it is necessary to first clear all connecting piping and equipment of chlorine vapors. Previously this has been done by venting these lines into a caustic liquid solution. The existing vessel for this purpose is severely corroded and is beyond repair, and can no longer be used. Presently the chlorine vapors are vented off to the cooling tower. This is not an acceptable permanent method of clearing the system. Chlorine is a dangerous and noxious vapor and its emission is a safety hazard.

This project consists of a caustic scrubber and circulation system. The chlorine vapor will enter the scrubber and will be removed via reaction with a caustic solution. A scrubber distributor is included to insure complete vapor-liquid contact and a pump is included for removal of spent liquid and for circulation of the caustic solution.

Alternatives

The existing vessel could be relined and used with caustic for removal of chlorine. The vessel shell is severely corroded and repair would be exorbitantly expensive if not impossible. The replacement of the system with the system proposed in this project is a more economical and reliable step to contain the chlorine vapors.

Project Economic Summary

No project economics were calculated for this item. This project is being justified solely for safety and pollution control and has no cost savings features.

CWH 000006582

1975 CAPITAL BUDGET

Lake Charles VCM Plant

V-13

PLANT BREATHING AIR SYSTEM

\$100,000 Capital $\pm$ 25%

Project Description

The funds requested in this project are for the installation of a plant breathing air system. An existing air compressor will be revised for use as a breathing air supply. An in plant breathing air header will be installed with connections in the VCM tank car loading area and within the process area. These connections will be located so they are accessible for VCM loading, normal maintenance, shut-down tasks and any other instances where fume emissions will require the use of a fresh air breathing system.

Problem Description

Impending regulations by OSHA will place severe limits on ambient air VCM concentrations in employee breathing areas. As a result the use of contained breathing air systems will be necessary for the foreseeable future. The plant now uses purchased bottled air for this purpose. This procedure results in substantial costs and it is difficult to keep the bottled air system supplied and functional.

The proposed system will provide an air supply source at all necessary locations in the loading area and within the process. This system should provide a reliable breathing air source for normal operating conditions, maintenance requirements, and turnaround tasks where fume emissions require the use of breathing air.

Alternatives

The only alternative to this project is to continue use of bottled air. This would represent a substantial safety and operating hazard and may not be acceptable during plant turnarounds. The result could be an extension of turnaround time requirements with a subsequent production loss due to the downtime.

Project Economics Summary

No project economics were determined for this item. This expenditure is justified for reasons of health and safety and has no cost savings features.

1975 CAPITAL BUDGET

Lake Charles VCM Plant

V-14

PLANT SECURITY SYSTEM

\$20,000 Capital + 25%

Project Description

This project consists of a system to prevent intrusion onto plant property by unauthorized personnel. It will improve control of contractor traffic into the process area and reduce thefts from plant and employee property.

A remote operated gate will be installed near the electric substation with a voice communication system connected into the plant's control room. This gate would remain closed and would open only upon a request to the control room. This would prevent unauthorized and aimless traffic into process area.

A closed circuit television camera will be installed at the main plant gate. This device will allow visual identification of individuals requesting admittance onto plant property and surveillance of plant employee parking areas.

Problem Description

The plant does not employ a gate guard. During 2nd and 3rd shifts, entrance to the plant is gained by telephone identification with the control room. The control room can open the gate via a remote electronic operator. This system does not achieve positive identification of individuals seeking entrance.

Once inside the gate there is no means of controlling access into the process area. Instances have occurred when unauthorized contractor employees have entered the plant. The installation of the proposed system will deter thefts and prevent safety hazards by controlling access onto plant property.

Alternatives

Other alternatives of insuring plant security through electronic methods of identification and detection exist and are under consideration.

CWH 000006584

1975 CAPITAL BUDGET

Lake Charles VCM Plant

V-15

CRITICAL EQUIPMENT REPLACEMENT

\$80,000 Capital + 15%

Project Description

This project provides funds to purchase replacement equipment for the following items:

- | | |
|--------------------|----------|
| 1) Water Wash Tank | \$60,000 |
| 2) R-304 Preheater | \$20,000 |

Problem Description

- 1) Water Wash Tank - The existing vessel in this service was installed in 1968 and is a used 400 barrel oil tank. In this service the vessel is periodically subjected to caustic and acidic solutions. Corrosion has occurred in the lower portion of the tank and replacement will be required. This existing vessel operates at atmospheric pressure and an atmospheric vent is located at the top of the tank. This vent is the source of a venting of EDC and VCM vapors. The replacement of this existing tank with an identical atmospheric tank is not advisable. The replacement of the vessel with a pressured tank is preferred as this will permit containment of vapor emissions and reduction of employee exposure. Funds are requested in 1975 so the vessel may be purchased and available for installation in late 1975 or early 1976.
- 2) R-304 Preheater - The R-304 Preheater was replaced with a larger exchanger for the 20 MM pound per year debottlenecking and the original H-304 is now designated as an H-310 spare. As a result no adequately sized spare exists for the H-304 exchanger now in service. Funds are requested for the purchase of a new R-304 Preheater to serve as a spare for this critical service item.

Alternatives

No alternatives were considered.

Project Economics Summary

No conventional economics can be calculated on this item. If the equipment called for fails and no replacements are available the following will result.

- 1) Failure of the Water Wash Tank - This would result in a direct feed of wet crude EDC from storage into the light ends column. The Water Wash Tank functions as a settling vessel for carryover of water prior to light ends column feed. This would cause an increase in light ends column fouling.

CWH 000006585

- 2) Failure of H-304 would result in installing a smaller replacement exchanger until repairs were made at an outside shop. This would cause a rate reduction of 3% for a period of 4 to 6 weeks while the repairs were being made.

CWH 000006586

1975 CAPITAL BUDGET

Lake Charles VCM Plant

V-16

LABORATORY INSTRUMENTS

\$27,000 Capital $\pm$ 10%

Project Description

Control Laboratory

Funds are requested for the purchase of a Metrohm End Point Titrator E 526 System (\$7,125), Lindberg Box Furnace Model 51232 (\$500), Millipore Q₂/Q₃ Water System (\$1345), and a Labwasher catalog No. 84-3000 type A (\$925).

Environmental Laboratory

Funds are requested for the purchase of a Dohrman Microcoulometric System Model MCTS-20-D Halogen System (\$9725), a Bendix Flasher Assembly (\$600), Four Bendix H/S 10 Sample Systems (\$800), and a Hall Electrolytic Conductivity Detector (\$2850).

Problem Description

Control Laboratory

The titration system will be used to obtain an accurate caustic analysis and will result in smoothing out the operation of the plant's EDC caustic wash system. The box furnace will replace an old muffle furnace which is in continual need of repair and inadequate for current requirements. The Millipore Water System will provide high quality water needed for preparation of analytical reagents, metals analysis by atomic absorption and cleaning of glassware. The Labwasher will provide cleaner glassware which is required for many biological and analytical tests.

Environmental Laboratory

The Dohrman Microcoulometric System would be used to analyze the effluent water for total organic chlorides. It is very likely that total organic chloride analysis will be required by our NPDES permit. However, funds for this instrument will not be committed until the permit is finalized.

A Hall Electrolytic Detector would provide a gas chromatographic detector specific for the determination of chlorinated organics in either ambient air or effluent water samples. The Bendix H/S 10 sampler and flasher assembly would replace the existing ambient air testing equipment and eliminate the hazards associated with handling carbon disulfide as used in the present analytical procedure. This expenditure will not be required if some other

means of ambient air analysis is adopted. Other methods such as air bag systems are under study and money will not be committed until developmental testing is complete.

Budget History

	1971	<u>Approved Budget (\$)</u>		
		1972	1973	1974
Control Lab.	7,500	8,500	16,000	9,350
Manufacturing Lab.	23,000	-	-	1,650
Environmental Lab.	-	-	-	-
Total	30,500	8,500	16,000	11,000

	1971	<u>Actual Expenditure (\$)</u>		
		1972	1973	1974
Control Lab.	7,400	8,373	15,572	5,843 (1)
Manufacturing Lab.	23,045	-	-	(2)
Environmental Lab.	-	-	-	-
	30,445	8,373	15,572	(3)

- 1) Represents amount committed through July 1, 1974.
- 2) Anticipated 1974 expenditure is \$1, 650.
- 3) Anticipated 1974 expenditure is \$11,000.

Project Economics Summary

No project economics are computed on this item.

1975 CAPITAL BUDGET

Lake Charles VCM Plant

V-17

MAINTENANCE TOOLS

\$13,000 $\pm$ 15%

Project Description

The following tools are to be purchased:

1)	Field flaring tools for teflon piping	\$ 750
2)	2-Cleco impact wrenches - 1 5/8" - Model 1030	2100
3)	2-Cleco impact wrenches - 1/2" - Model WP-200 (Replacement)	850
4)	Cleco Model OW-BD chipping hammer (Replacement)	450
5)	2-3/4 ton pull lifts (Replacement)	250
6)	2 -1 ton pull lifts (Replacement)	300
7)	2 - 1/2 ton chain lifts (Replacement)	500
8)	Horizontal metal cut bandsaw (Replacement)	1700
9)	Craftsman combination 8" saw	350
10)	No. CC475 kit with airtool cleaning motor and adaptor for use with Elliot tools	800
11)	Arbor press	650
12)	Milling attachment for Lathe	250
13)	Furnace cleaning tools	1200
14)	Cleco #125 die grinder	300
15)	2 - 1 ton chain lifts	600
16)	TIF digital power probe PP1000 clamp volt ohm-amp meter	180
17)	Honeywell test module #II for G. C. Checkout	400
18)	10 - model 310 miniature volt ohm meters	600
19)	2 - model 10 ammeter adaptors	70
20)	Bearing puller for instrument shop	700

These tools are expected to increase the maintenance force's efficiency and also to give it increased capabilities.

Problem Description

The additional maintenance tools are needed by the Mechanical Department in order to eliminate problems which have occurred in the past year and which are expected to reoccur in the future.

CWH 000006589

Budget History

<u>Approved Budget (\$)</u>		
<u>1972</u>	<u>1973</u>	<u>1974</u>
0	0	8000
<u>Actual Expenditures (\$)</u>		
<u>1972</u>	<u>1973</u>	<u>1974</u>
0	0	7758

Project Economics Summary

No project economics are computed on this item.

CWH 000006590

1975 CAPITAL BUDGET

Lake Charles VCM Plant

V-18

MISCELLANEOUS ITEMS UNDER \$2,500.

\$25,000 Capital

Project Description

Capital funds are requested for miscellaneous items that will be required in 1975. Typical items included in this miscellaneous category are minor equipment additions, additional safety equipment and additions to laboratory equipment.

Problem Description

This item provides funds for miscellaneous small projects which will be required in 1975, but which cannot be defined at this time.

Budget History

Approved Budget (\$)

1971	1972	1973	1974
20,000	20,000	20,000	20,000

Actual Expenditures (\$)

1971	1972	1973	1974
10,381	19,538	20,398	13,000

(first 6 mos.)

Because of inflated prices and the cost trend during 1974 the plant is requesting \$25,000 in funds for this project in 1975.

Project Economics Summary

No project economics were completed for this item.

CWH 000006591

1975 CAPITAL BUDGET

Lake Charles VCM Plant

V-1M

ENVIRONMENTAL PROTECTION AGENCY NPDES WATER

\$1,300,000 Capital ± 25%

PERMIT COMPLIANCE (POTENTIAL REQUIREMENTS)

Project Description

The following additional items may be required to bring the plant's effluent water into compliance with the Environmental Protection Agency Draft National Pollutant Discharge Elimination System (NPDES) permit conditions. The capital requirements are preliminary estimates and will be further defined as the permit conditions, scope and processes of this item are finalized.

- 1) Chromate Removal From the Cooling Tower Blowdown
Installation of a chrome precipitation unit to lower the total chrome in the cooling tower blowdown to less than 0.25 parts per million by weight. Estimated Capital \$400,000.
- 2) Effluent Carbon Adsorption
Installation of an activated carbon adsorption system including furnace regeneration and neutralization facilities. This item will lower the chlorinated hydrocarbon and BOD₅ concentrations in the effluent water to NPDES permit conditions. Estimated Capital \$900,000.

Problem Description

The draft NPDES water discharge permit requires that the VCM Plant's effluent water meet the following conditions after July 1, 1976. Present (1974) discharge conditions of the plant's effluent are shown for comparison.

COMPARISON OF DRAFT NPDES PERMIT CONDITIONS WITH 1974 ACTUAL DISCHARGE CONDITIONS

	BOD ₅ ^a	TSS ^b	Chrome ^c	R-Cl's ^d
<u>Pounds Per Day - Average</u>				
Draft Permit - After 7-1-76	209	316	0.25 ppm	72
1974 Operation	2940	1720	3.4 ppm	1248
<u>Pounds Per Day - Maximum</u>				
Draft Permit - After 7-1-76	468	720	0.5 ppm	144
1974 Range	Nil-7919	333-4685	Nil-6.0 ppm	Nil-3303

^aBOD₅ - 5 Day Biological Oxygen Demand

^bTSS - Total Suspended Solids

^cChrome - Parts Per Million By Weight
After 7-1-76 Water Leaving A Chromate Removal System Must Meet The Specified Levels.

CWH 000006592

^dR-Cl's - Chlorinated Hydrocarbons Calculated As 1,2 - Dichloroethane

Installation of items 1 and 2 of the project description should allow the VCM Plant to meet the draft NPDES permit conditions on Chrome and Chlorinated Hydrocarbons.

Alternatives

- 1) The plant will seek revised permit conditions through negotiations with the Environmental Protection Agency. The VCM Plant, with some secondary system modifications, should have Best Practicable Control Technology Currently Available (BPCTCA) for treatment of the plant's effluent water. BPCTCA Standards for VCM plants were published in the Federal Register and will be required in 1977. These standards were used by the EPA to set the Draft NPDES Permit conditions after 7-1-76. It is the plant's belief that meeting these requirements will require carbon adsorption of the plant's effluent water. Carbon adsorption is commonly thought of as tertiary treatment and therefore should not be applied as BPCTCA. The VCM Plant will seek revised NPDES permit conditions to reflect BPCTCA without carbon adsorption. Funds will not be committed for the carbon adsorption portion of this item until all appeals to change the draft NPDES permit condition have been exhausted.
- 2) Alternatives to the chrome precipitation system are ion exchange of the cooling water blowdown and conversion to a non-chromate cooling water treatment system. Tests will be conducted on all alternatives prior to selection of a final chrome removal system.

Project Economic Summary

No project economics were determined. This project is being installed solely for pollution control and has no costs savings. Operating costs are significant for the above items. The major costs are summarized as follows:

	<u>Chrome Removal</u>	<u>Carbon Adsorption</u>
Maintenance Costs and Operating Labor	\$20,000	\$ 70,000
Operating Supplies (Carbon, Sulfuric Acid, etc.)	\$15,000	\$160,000
Utilities (Steam, Fuel, and Electricity)		\$ 70,000
Total	\$35,000	\$300,000

CWH 000006593

1975 CAPITAL BUDGET

Lake Charles VCM Plant

V-2M

PLANT INCINERATOR

\$4,000,000 Capital + 50%

Project Description

This item will provide funds for the installation of a plant incinerator system. This system will be capable of incinerating the hydrocarbons in the oxychlorination vent and will utilize existing by-products (tars and light ends) as a fuel source. The system will also include facilities for recovery of anhydrous HCl which will be recycled to the process and facilities to recover heat by generating high pressure steam.

Problem Description

Further regulations by the EPA regarding emissions of hydrocarbons are anticipated. The VCM health problem has greatly amplified concern over atmospheric emissions of VCM. Depending on the nature and stringency of these future regulations, the installation of a plant incinerator system may be required.

A hydrocarbon compliance plan was filed by the plant with the Louisiana Air Control Commission (LACC) in October. We interpreted emission requirements as being applicable only to reactive hydrocarbons. The LACC has agreed with this approach. It is possible the EPA will disagree and apply regulations on a total hydrocarbon basis. In this eventuality they can overrule the LACC and thus invalidate our compliance plan. Installation of an incinerator would then represent the only solution to the plant emission problem.

Presently, the VCM Plant produces a by-product Tars Stream (Heavier than EDC chlorinated compounds). The tars are transferred to PPG at a cost to the VCM Plant of \$30/ton. This contract will expire in 1978 and it's future after 1978 is questionable. A method of disposing of these tars must be developed and this project offers a solution.

Project engineering equipment procurement and startup of an incineration system may take up to two years. Therefore, project planning and engineering should begin at the earliest possible time.

Project Economic Summary

This project is being submitted as a necessary pollution abatement project and has no economic return. Some contribution to profit will be made through recovery of anhydrous HCl and steam. However, anticipated operating costs of this system are approximately \$600,000 per year. This will about equal the value of the recovered anhydrous HCl and steam which is also about \$600,000. This amount of the HCl recovered must be consumed in the plant oxychlorination unit or transferred away from the plant. Consumption of this HCl within the plant may require an oxychlorination expansion or the flexibility to use the HCl in Methyl Chloride production.

CWH 000006594



Interoffice Communication

To Distribution
From Douglas Michels
Date May 21, 1974
Subject 1975 Capital Budget

The completion date for submittal of the VCM Plant's 1975 capital budget is approaching. A preliminary list of items that will be evaluated for the budget is attached. Comments and additions to this list are required for us to plan for the preparation of the budget. Please return your comments and additions to me by June 10, 1974.

Douglas Michels

brc

CC

RDG - RHG - JRH - GGD - J T G - P LF - CEG - LNW - JSR - JCL - DCS

CWH 000006595

Preliminary Project List
1975 Capital Budget Items

1. Chlorine - HCL Blowdown Scrubber
2. Rail Car Chlorine Heel Recovery
3. Oxy Catalyst Removal System
4. Transfer Line Exchanger
5. EDC Tank Vent Recovery
6. Cooling Water Turbine Replacement
7. Oxychlorination Turboexpander
8. Ethylene Feed Gas Turboexpander
9. Fuel Gas Turboexpander
10. Critical Equipment Replacement, H-304, T-104

11. Incinerator
12. Phase II Debottlenecking
13. Boiler Feedwater to VCM Plant Pipeline
14. Vinyl Column Feed to Bottoms Exchanger
15. Oxychlorination Interchanger
16. Quench Interchanger
17. Furnace Preheat Coil Replacement
18. Chlorine Scrubbing System
19. VCM Quality Improvement
20. New Firewater Pump

21. Vent Stack Flow Measurement
22. Secondary System Modifications
23. Cracking Furnace Initiator System
24. Vinyl Chloride Ambient Air Emission Control
25. Laboratory Equipment
26. Maintenance Equipment
27. Miscellaneous Items Under \$2500
28. On-Line Spare S-309
29. Start-up Steam Condensate Collection
30. Furnace Barrier Curtain for Vapor Clouds

31. Additional Post Indicator Valves
32. OSHA Compliance Items
33. Water Effluent Monitoring
34. Air Effluent Monitoring
35. Additional C-103 Reboiler
36. Shop Modification

CWH 000006596

1974 CAPITAL BUDGET 74

CWH 000006597

del

from

C. H. McGLOTHLIN

January 14, 1974

To Distribution Below

Attached is the approved 1974 Capital

Commitment Budget.

jb

C.H. McGlothlin

Distribution:

J.D. Bryan	A.J. Lacazette
J.D. Burns	J.J. Langford
W.B. Carter	V. Mylan
H.R. Flammer	J.F. Pinkman
R.M. Howe	K.L. Schurter
W.C. Kolar	L.N. Vernon

Plant Managers:

R.D. Gamblin	LC VCM
R.E. Lehmkuhl	LC Chem
J.B. Maher	Hammond
C. Miller	Newark
B.D. Ratliff	Baltimore
E.M. Smith	Aberdeen
G.F. Tillson	Ok City

CWH 000006598

H. G. McLean
Southern

(1000000)

Interoffice Communication

To: Executive Vice Presidents, Division Presidents,
Senior Vice Presidents, Division Executive Vice
Presidents, Functional Department Managers

From: Howard W. Blauvelt

Date: January 8, 1974

Subject: 1974 Capital Commitment and Exploration Expense Budgets

Continental's Board of Directors has approved the 1974 Capital Commitment and Exploration Expense budgets in the amounts of \$548.9 million and \$63.2 million, respectively.

Both the capital budget and the exploration expense budget are the largest initial budgets for their respective purposes in the Company's history. In addition, plans have been reviewed with the Board for possible additional commitments in 1974 for specific programs and projects, which were not ready for inclusion in the initial budgets but may come to fruition during the year. As an indication of the magnitude of these additional commitments, a contingency fund of \$112 million has been recognized in our financial plans as the 1974 cash requirements of these possible additions to our budgets.

The size of our initial and contemplated budgets is one clear indication of the aggressive response our Company is making to the problems of energy shortages. The functional distribution of these budgets reveals heavy emphasis on the discovery and development of new energy supplies, both in the United States and abroad, and the construction of transportation facilities needed for the large-scale movements of foreign crude oil to domestic coastal and interior refineries. In each of these areas, our budget philosophy has been to provide all of the funds that could be handled, taking into consideration the availability of skilled personnel and materials and the prior claims of existing operations.

In the other areas of our operations--those which are users rather than producers of feedstocks and energy materials--our budget approach has been necessarily highly selective, both to conserve funds for the solution of the energy shortages and to avoid creating additional claims on already-short supplies.

The approved capital budget detail for your area of responsibility is attached.

Howard W. Blauvelt

HWB:als
Attachment
cc: John G. McLean

CWH 000006599

✓

CHEMICALS DIVISION
1974 CAPITAL COMMITMENT BUDGET

CWH 000006600

CHEMICALS
1974 CAPITAL COMMITMENT BUDGET
SUMMARY
(\$000)

	<u>Amount</u>
Conoco Chemicals	\$16,018
Continental Carbon	<u>1,981</u>
	<u>\$17,999</u>

All items are near-term cash.

CWH 000006401

12.21.73

CONOCO CHEMICALS
1974 CAPITAL COMMITMENT BUDGET
SUMMARY BY CLASSIFICATION
(\$000)

<u>Classification Summary</u>	<u>Amount</u>
Plant Expansion and Modernization	\$ 433
Product Improvement	30
Cost Savings	1,799
Pollution Abatement	3,826
Safety	562
Miscellaneous/Unallocated	2,330
Lake Charles Alumina	7,000
Subtotal	<u>\$15,980</u>
Furniture and Office Equipment	38
Total	<u><u>\$16,018</u></u>
 <u>Plant Expansion and Modernization</u>	
Aberdeen	\$ 80
Hammond	168
Newark	120
Oklahoma City	65
Total	<u>\$ 433</u>
 <u>Product Improvement</u>	
Oklahoma City	\$ 30
 <u>Cost Savings</u>	
Aberdeen	\$ 12
Baltimore	595
Lake Charles Chemical	610
Lake Charles VCM	265
Newark	282
Oklahoma City	35
Total	<u>\$ 1,799</u>

Continued....

CWH 000006602

CONOCO CHEMICALS
1974 CAPITAL COMMITMENT BUDGET
SUMMARY BY CLASSIFICATION
(\$000)

	<u>Amount</u>
<u>Pollution Abatement</u>	
Aberdeen	\$ 288
Baltimore	500
Lake Charles Chemical	543
Lake Charles VCM	2,450
Oklahoma City	45
Total	<u>\$ 3,826</u>
<u>Safety</u>	
Aberdeen	\$ 240
Baltimore	16
Lake Charles Chemical	163
Lake Charles VCM	25
Newark	95
Oklahoma City	23
Total	<u>\$ 562</u>
<u>Miscellaneous</u>	
Aberdeen	\$ 684
Baltimore	52
Hammond	18
Lake Charles Chemical	281
Lake Charles VCM	169
Newark	26
Oklahoma City	100
Total	<u>\$ 1,330</u>
<u>Unallocated</u>	<u>\$ 1,000</u>
<u>Lake Charles Alumina - New Project</u>	<u>\$ 7,000</u>
Total	<u>\$15,980</u>
<u>Furniture and Office Equipment</u>	<u>\$ 38</u>
Grand Total	<u><u>\$16,018</u></u>

12/21/73

CWH 000006603

3-1-8 ✓

1974 CAPITAL BUDGET SUMMARY
LAKE CHARLES VCM PLANT
(\$000)

Cost Savings

V-1	Residual Chlorine Reactor	\$	40
V-2	Acetylene Hydrogenator	\$125 Capital	
		75 Licensing Fee	200
V-3	Oxychlorination On-Stream Analyzer		<u>25</u>
	Subtotal	\$	265

Pollution Abatement

V-4	Effluent Water Filter	\$	100
V-5	Additional Tars Storage		50
V-6	Louisiana Ambient Air Standards Compliance		<u>2,300</u>
	Subtotal	\$	2,450

Safety

V-7	Maintenance Building Modification	\$	25
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Miscellaneous

written

V-8	Critical Equipment Replacement	\$	95
V-9	Miscellaneous Items under \$2,500		20
V-10	Laboratory Instruments		11
V-11	Maintenance Tools		8
V-12	Moisture Analyzers		<u>35</u>
	Subtotal	\$	169
	Total	\$	2,909

12/21/73

CWH 000006604

3-1-11 ✓

1974 CAPITAL BUDGET SUMMARY
NEW PROJECTS AND UNALLOCATED

New Projects

NP-1 Lake Charles Alumina

\$7,000

Unallocated

\$1,000

12/21/73

CWH 000006605



Interoffice Communication

To As Listed
From R. D. Gamblin
Date September 7, 1973
Subject VCM Plant 1974 Capital Budget Addition

Please add the attached budget item to those previously issued in the 1974 Capital Budget.

R. D. Gamblin

is

enc

CC + enc:

FK-JDBu-LNV-JDBr-RHG-TJG

RSM-GGD-JRH-LNW-JCL-JDM

DCS-PLF-WCK

CWH 000006606

Interoffice Communication

To L. N. Vernon
 From R. D. Gamblin
 Date September 6, 1973
 Subject VCM Plant - Phase II Debottlenecking

As a result of Mr. Burns' request, we are including the Phase II Debottlenecking project in the 1974 Capital Budget. The project description is attached. You should be aware of the following details some of which are not included in the project description.

- 1) The original estimate for this project of \$500 M did not include the revisions for additional refrigeration since it was anticipated that repairs to the propylene compressor during the August turnaround might eliminate this problem. About \$200 M is included in this estimate for increased refrigeration. However, the final solution to this problem is not defined at this time and the estimate is no better than $\pm 50\%$.

- 2) Expenditure breakdown is:

\$646 M	- Equipment
111 M	- Labor
29 M	- Tax
78 M	- Contingency
5 M	- Freight
21 M	- Expense
<u>\$890 M</u>	

Equipment costs are based on phone quotes from vendors and should be $\pm 15\%$.

- 3) A change from the original design concept increased costs by \$134 M. This design change incorporates an energy conservation feature which will save an estimated \$70 M/year in steam costs.
- 4) Commitment for all major equipment items except the refrigeration system revisions could be made around November 1 if funds were available. This is one month later than earlier estimates, but this schedule allows time for PED and CED reviews. The following schedule is anticipated:

CWH 000006607

L. N. Vernon
Page 2
September 6, 1973

September 17 - Process Design Complete
October 8 - In-plant Estimate Complete
October 8 - PED Review Complete
October 22 - CED Review Complete
November 1 - AFE Submitted

- 5) A schedule for design completion on the refrigeration system cannot be made until Elliott personnel evaluate current operating data which are being transmitted September 7.
- 6) This design requires either the use of BASF oxychlorination catalyst or continuous transfer of 35-40 T/D HCl to Methyl Chloride Plant in order to obtain the projected rates. Evaluation of the BASF catalyst is not expected to be complete before November 1.


R. D. Gamblin

is
enc

CWH 000006608

1974 CAPITAL BUDGET SUMMARY

LAKE CHARLES VCM PLANT

		<u>Capital (\$)</u>
<u>Plant Expansion and Modernization</u>		-
V-1A Phase II Debottlenecking		\$ 840,000
<u>Product Improvement</u>		0
<u>Cost Savings</u>		
V-1 Residual Chlorine Reactor		\$ 40,000
V-2 Acetylene Hydrogenator	\$125,000 Capital	
	<u>75,000</u> Licensing Fee	200,000
V-3 Oxychlorination On-Stream Analyzer		25,000
Subtotal		<u>\$ 265,000</u>
<u>Pollution Abatement</u>		
V-4 Effluent Water Filter		\$ 100,000
V-5 Additional Tars Storage		<u>50,000</u>
Subtotal		<u>\$ 150,000</u>
<u>Safety</u>		
V-6 Maintenance Building Modification		\$ 25,000
<u>Miscellaneous</u>		
V-7 Moisture Analyzers		\$ 35,000
V-8 Critical Equipment Replacement		95,000
V-9 Miscellaneous Items Under \$2,500		20,000
V-10 Laboratory Instruments		11,000
V-11 Maintenance Tools		<u>8,000</u>
Subtotal		\$ 169,000
GRAND TOTAL		<u><u>\$ 1,449,000</u></u>
<u>Memorandum Items</u>		
V-1M VCM Quality Improvement		\$ 145,000
V-2M Chlorine Scrubbing System		212,000
V-3M Tars Disposal System		2,650,000
V-4M Louisiana Ambient Air Standards Compliance		2,700,000
V-5M Additional Liquid Chlorine Unloading Facilities		<u>35,000</u>
TOTAL		<u><u>\$ 5,742,000</u></u>

1974 CAPITAL BUDGET

CASH FLOW SUMMARY (Cash Flows in M\$)

PROJECT YEAR	<u>0</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>
<u>Project</u>											
V-1A.	(840.0)	174.7	253.2	250.2	247.0	243.6	239.9	236.1	186.9	183.8	327.5
V-1	(40.0)	18.2	20.5	23.0	24.6	25.2	25.9	26.5	21.8	22.2	26.4
V-2	(200.0)	65.2	71.3	74.8	74.8	74.2	53.8	58.4	46.1	48.0	61.9
V-3	(25.0)	19.9	19.9	19.9	19.9	19.9	19.9	19.9	15.1	15.1	17.0
Subtotal	(1105.0)	278.0	364.9	367.9	366.3	362.9	339.5	340.9	269.9	269.1	432.8
DCF, %						32.9					
V-4	(25.0)	0.6	0.6	0.6	0.6	0.6	0.6	0.6	1.0	1.0	1.9
V-5	(100.0)	2.2	2.2	2.2	2.2	2.2	2.2	2.2	4.1	4.1	8.2
V-6	(50.0)	1.1	1.1	1.1	1.1	1.1	1.1	1.1	2.1	2.1	3.9
V-7	(35.0)	0.8	0.8	0.8	0.8	0.8	0.8	0.8	1.4	1.4	2.8
V-8	(95.0)	2.1	2.1	2.1	2.1	2.1	2.1	2.1	3.9	3.9	7.9
V-9	(20.0)	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.8	0.8	1.7
V-10	(11.0)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.5	0.5	0.9
V-11	(8.0)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.8
Subtotal	(344.0)	7.6	7.6	7.6	7.6	7.6	7.6	7.6	14.1	14.1	28.1
DCF, %						0.0					
Total	(1449.0)	285.6	372.5	375.5	373.9	370.5	347.1	348.5	284.0	283.2	460.9
						23.3					

CWH 000006610

1974 CAPITAL BUDGET

Lake Charles VCM Plant

V-1A

PHASE II DEBOTTLENECKING

\$840,000 Capital $\pm$ 25%
\$ 50,000 Expense Including
Sales Tax

Project Description

The following equipment revisions and additions are needed to increase plant production by 20 MM pounds per year:

- 1) Quench/EDC Interchanger and Pumps
- 2) Furnace Feed EDC Heater
- 3) An additional EDC Furnace Charge Pump
- 4) An additional Primary Oxychlorination Phase Separator
- 5) A New Oxy After Condenser Receiver
- 6) Heavy Ends Column Feed Pumps
- 7) Heavy Ends Column Feed Preheater
- 8) Retracting the Heavy Ends Column
- 9) Heavy Ends Column Reflux Pumps
- 10) Line and Control Valve replacement where needed
- 11) Revisions to the HCl Column to reduce entrainment
- 12) An additional Oxy HCl Feed Heater

The following additions are being made to reduce refrigeration load:

- 1) The addition of a steam/vacuum refrigeration system.
- 2) A larger finishing reactor after condenser.
- 3) The addition of an oxy interchanger.

In addition to the above equipment modifications, it will be necessary to attain additional oxychlorination capacity through the use of BASF catalyst or export 30-40 tons per day of HCl to the Methyl Chloride Plant.

This project follows a previous 20 MM pound per year debottlenecking project currently under construction. The Phase II project will bring plant capacity to 730 MM pounds per year. A budget item for a major expansion to increase plant capacity from 730 MM to 1,015 MM pounds per year is being written by the Project Development Group.

Problem Description

Plant capacity is currently limited to 690 MM pounds per year. A current debottlenecking project will increase this to 710 MM. Market conditions indicate that production above this level can readily be sold.

CWH 000006611

Alternatives

The only significant alternate to this project is to proceed immediately with the major expansion to 1,015 MM pounds per year. One advantage to this approach is that about \$570,000 of the proposed \$840,000 investment could be saved. However, if it is assumed that the Phase II Debottlenecking will be on stream 24 months before the major expansion, the \$570,000 will have a return of 20 to 40 percent depending on the salvage value assumed. This return would, of course, improve significantly if the margin were greater than the 1.944 ¢/lb. assumed.

Project Economics Summary

The investment of \$840,000 capital and \$50,000 expense (including \$29,000 sales tax) has a discounted payout period of 4.5 years and a 10-year DCF return of 27.6%. It is estimated that gross revenues will be increased by \$388,800 per year (1.944 ¢/lb. gross margin).

PHASE II DEBOTTLENECKING

CALCULATION OF PROJECT ECONOMICS

PROJECT YEAR	<u>0</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>
SALES, MM LBS.		20	20	20	20	20	20	20	20	20	20
REVENUES, \$M		388.8	388.8	388.8	388.8	388.8	388.8	388.8	388.8	388.8	388.8
COST, \$M											
Maintenance		63.0	66.8	70.8	75.0	79.5	84.3	89.4	94.7	100.4	106.4
Royalties		15.0	-	-	-	-	-	-	-	-	-
Depreciation		68.7	68.7	68.7	68.7	68.7	68.7	68.7	68.7	68.7	137.7
Taxes & Insurance		10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5
Expense		50.0									
Total		<u>207.2</u>	<u>146.0</u>	<u>150.0</u>	<u>154.2</u>	<u>158.7</u>	<u>163.5</u>	<u>168.6</u>	<u>173.9</u>	<u>179.6</u>	<u>254.6</u>
TAXABLE INCOME, M\$		181.6	242.8	238.8	234.6	230.1	225.3	220.2	214.9	209.2	134.2
INCOME TAX, M\$		<u>43.6</u>	<u>58.3</u>	<u>57.3</u>	<u>56.3</u>	<u>55.2</u>	<u>54.1</u>	<u>52.8</u>	<u>96.7</u>	<u>94.1</u>	<u>60.4</u>
AFTER-TAX INCOME, M\$		<u>138.0</u>	<u>184.5</u>	<u>181.5</u>	<u>178.3</u>	<u>174.9</u>	<u>171.2</u>	<u>167.4</u>	<u>118.2</u>	<u>115.1</u>	<u>73.8</u>
OPERATING CASH FLOW, M\$		206.7	253.2	250.2	247.0	243.6	239.9	236.1	186.9	183.8	211.5
INVESTMENT, M\$	(840)										
WORKING CAPITAL, M\$		(32.0)									32.0
SALVAGE, M\$											84.0
NET CASH FLOW, M\$	(840)	174.7	253.2	250.2	247.0	243.6	239.9	236.1	186.9	183.8	327.5
DCF RETURN, %	27.6										
DISCOUNTED PAYOUT PERIOD, YRS.	4.5										

CUH 00000613

PHASE II DEBOTTLENECKING
PROJECT ECONOMICS SENSITIVITY ANALYSIS

Base Case: Commitment: \$840,000 Capital DCF Return: 27.6%
 \$ 29,000 Sales Tax
 \$ 21,000 Expense

<u>Possible Variances</u>			<u>% DCF Return</u>	
<u>Minus</u>	<u>Plus</u>		<u>Impaired To</u>	<u>Improved To</u>
15 %	30%	Capital Commitment	15.8%	36.5%
50 %	50%	Production	3.2%	52.2%
0.5 ¢/lb.	0.5 ¢/lb.	Gross Margin	15.6%	40.5%
(1)0.5 %	-	Oxy Impairment	15.7%	-
	-	24% Tax Rate Over Project Life	-	28.8%
		Combination	0%	90.8%

(1) This item assumes that Oxy HCl conversions are reduced by 0.5%.

PHASE II DEBOTTLENECKING
PROJECT ECONOMICS ASSUMPTIONS

Revenue

- 1) A margin of 1.944 ¢/lb. was used. This represents the projected 1974 margin between the vinyl transfer price of 6.0 ¢/lb. and variable costs of 4.056 ¢/lb.
- 2) Sales were taken as 20 MM pounds per year.

Costs

- 1) Maintenance - Assume 7.5% of capital per year. These were escalated at 6% per year. The maintenance expense was increased from the normal plant experience of 6% because of the nature of the equipment being installed.
- 2) Taxes and Insurance - Assume 1.25% of capital (plant experience).
- 3) Royalties - A royalty of 0.075 ¢/lb. was charged during the first project year. Royalties are projected to cease after this point.

Other

- 1) Working Capital - It was taken as the difference in 30-days accounts receivable less accounts payable.
- 2) Salvage Value - It was taken as 10% of construction capital due to the large quantity of Monel material used.
- 3) Startup Date - Fourteen months after AFE approval.

CWH 000006615



Interoffice Communication

To L. N. Vernon
From R. D. Gamblin
Date September 26, 1973
Subject VCM Plant 1974 Capital Budget

The VCM Plant 1974 Capital Budget has been revised as follows:

- 1) Memo Item V-4M "Louisiana Ambient Air Standards Compliance" has been changed to budget Item V-4.
- 2) Item V-1A "Phase II Debottlenecking" has been changed to a memo item as requested by Saddle Brook.
- 3) Memo Items V-2M "Chlorine Scrubbing System" and V-3M "Tars Disposal System" have been dropped because the need for these items has been removed by the "Louisiana Ambient Air Standards Compliance" project.

All budget items will be re-numbered as necessary by Saddle Brook to incorporate the above changes and will appear as shown on the attached summary pages.


R. D. Gamblin

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CC + enc:
FK-JMcC-JDBr-RHG-TJG
RSM-GGD-JRH-LNW-JCL-JDM
DCS-PLF-WCK

CNH 000006616

1974 CAPITAL BUDGET SUMMARY

LAKE CHARLES VCM PLANT

		Capital (\$)
<u>Plant Expansion and Modernization</u>		\$ 0
<u>Product Improvement</u>		\$ 0
<u>Cost Savings</u>		
V-1	Residual Chlorine Reactor	\$ 40,000
V-2	Acetylene Hydrogenator	\$125,000 Capital
		75,000 Licensing Fee
V-3	Oxychlorination On-Stream Analyzer	200,000
		25,000
	Subtotal	\$ 265,000
<u>Pollution Abatement</u>		
V-4	Louisiana Ambient Air Standards Compliance	\$2,300,000
V-5	Effluent Water Filter	100,000
V-6	Additional Tars Storage	50,000
	Subtotal	\$2,450,000
<u>Safety</u>		
V-7	Maintenance Building Modification	\$ 25,000
<u>Miscellaneous</u>		
V-8	Moisture Analyzers	\$ 35,000
V-9	Critical Equipment Replacement	95,000
V-10	Miscellaneous Items Under \$2,500	20,000
V-11	Laboratory Instruments	11,000
V-12	Maintenance Tools	8,000
	Subtotal	\$ 169,000
	GRAND TOTAL	\$2,909,000
<u>Memorandum Items</u>		
V-1M	Phase II Debottlenecking	\$ 840,000
V-2M	VCM Quality Improvement	145,000
V-3M	Additional Liquid Chlorine Unloading Facilities	35,000
	TOTAL	\$1,020,000

CWH 000006617

1974 CAPITAL BUDGET

CASH FLOW SUMMARY
(Cash Flows in M\$)

PROJECT YEAR	<u>0</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>
<u>Project</u>											
V-1	(40.0)	18.2	20.5	23.0	24.6	25.2	25.9	26.5	21.8	22.2	26.4
V-2	(200.0)	65.2	71.3	74.8	74.8	74.2	53.8	58.4	46.1	48.0	61.9
V-3	(25.0)	19.9	19.9	19.9	19.9	19.9	19.9	19.9	15.1	15.1	17.0
Subtotal	(265.0)	103.3	111.7	117.7	119.3	119.3	99.6	104.8	83.0	85.3	105.3
DCF, %						49.6					
V-4	(2300.0)	50.2	50.2	50.2	50.2	50.2	50.2	50.2	94.1	94.1	188.1
V-5	(100.0)	2.2	2.2	2.2	2.2	2.2	2.2	2.2	4.1	4.1	8.2
V-6	(50.0)	1.1	1.1	1.1	1.1	1.1	1.1	1.1	2.1	2.1	3.9
V-7	(25.0)	0.6	0.6	0.6	0.6	0.6	0.6	0.6	1.0	1.0	1.9
V-8	(35.0)	0.8	0.8	0.8	0.8	0.8	0.8	0.8	1.4	1.4	2.8
V-9	(95.0)	2.1	2.1	2.1	2.1	2.1	2.1	2.1	3.9	3.9	7.9
V-10	(20.0)	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.8	0.8	1.7
V-11	(11.0)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.5	0.5	0.9
V-12	(8.0)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.8
Subtotal	(2644.0)	57.8	57.8	57.8	57.8	57.8	57.8	57.8	108.2	108.2	216.2
DCF, %						0.0					
Total	(2909.0)	161.1	169.5	175.5	177.1	177.1	157.4	162.6	191.2	193.5	321.5
						0.0					

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1974 CAPITAL BUDGET

Lake Charles VCM Plant

V-4

LOUISIANA AMBIENT AIR STANDARDS COMPLIANCE

\$2,300,000 $\pm$ 50%

Project Description

The following items are now being considered to bring plant air emissions into compliance with current Louisiana Ambient Air Standards. The capital requirements are preliminary estimates and will be further defined as the scope and processes of this item are finalized.

1. Main Plant Vent Stack

- a) Addition of a Cleanup Reactor (NR-305) System to the oxychlorination vent following the existing R-304 cleanup reactor. Estimated capital \$750,000.
- b) Addition of a Vent Incinerator. This system will include the capability to utilize existing byproducts (tars and light ends) as a fuel source. This will be compatible with future HCl recovery schemes. In addition, this installation will provide the flexibility to add other emission sources which may develop in future years. Estimated capital \$1,000,000 plus \$275,000/year operating cost.

2. Dock VCM Ship Loading Vent Revisions

Addition of compression and refrigeration equipment. Estimated capital required \$300,000.

3. Rail Car Loading Vent Revisions

Addition of refrigeration equipment. Estimated capital required \$100,000.

4. Atmospheric EDC Storage

Vent refrigeration. Requires two refrigeration units (one in plant and one at the docks) and seven condensers. Estimated capital \$150,000.

Problem Description

State air pollution regulations require that all industries meet a non-methane hydrocarbon standard of 160 micrograms per cubic meter in the ambient air beyond the nearest plant property line. The VCM Plant main vent (C-500), VCM dock

CWH 000006619

loading facilities, VCM rail car loading facilities and seven atmospheric EDC storage tanks emit hydrocarbons at levels which exceed this regulation. This regulation will require a reduction of hydrocarbon emissions from these sources of greater than 90%. State law requires total compliance with this regulation by June 1, 1975. An implementation schedule to meet the above regulations must be submitted to the State by October 25, 1973.

Alternatives

1. Seek exemptions by direct discussions with the Air Control Commission. The Ambient Air Regulations appear to contradict the intent of the emission regulations (a separate law) which exempts nonflammable vents. The plant expects to be in compliance with the emission regulation because of possible exemptions granted under this law.
2. Extension and addition of vent stacks to disperse hydrocarbons to below the 160 ug per cubic meter standard. This alternative offers only a short range solution at best, and may prove to be unacceptable to the Air Control Commission. Estimated capital \$1,000,000.
3. Incineration with HCl Recovery. This alternative will include in-plant distillation of plant tars to recover EDC and incineration of the plant vent plus the tars and light ends with anhydrous HCl recovery. Estimated capital \$3,400,000 plus \$575,000 per year operating costs.

Project Economic Summary

This project is being submitted as a necessary pollution abatement project and has no economic return. However, some contribution to profit will be made as a result of the various installations. VCM recovery makes the most significant contribution, primarily because of the significantly higher current netback price. A minimum of 1MM lbs./yr. of VCM and 0.5 MM lbs./yr. of EDC will be recovered. The VCM is valued at the average projected 1974 netback price of 6¢/lb. less recovery costs of 2.6 ¢/lb., or \$34,000 per year. The EDC is valued at the 1974 standard variable cost of 3.24 ¢/lb. less recovery costs of 2.36 ¢/lb., or \$4,400 per year.



Interoffice Communication

To J. D. Burns - Saddle Brook
From R. D. Gamblin
Date August 24, 1973
Subject 1974 Capital Budget

Attached is the VCM Plant 1974 Capital Budget. The overall budget totals \$609,000 with a combined DCF return of 16 percent. This is composed of projects totaling \$265,000 with a return of 49.6 percent and projects totaling \$344,000 with no economic return. In addition, five memo items totaling \$5,742,000 are shown. The Project Development Group will submit in their budget the proposed VCM Plant expansion to one billion pounds per year.

Item V-4M (Louisiana Ambient Air Standards Compliance) requires special attention. The State and Federal regulations were finalized July 2, 1973 and the VCM Plant received on July 30, 1973 a request to submit a schedule for compliance with those standards by June, 1975. Various alternatives are being investigated. The first alternative is to attempt to obtain a waiver based on what appears to be conflicts in the requirements outlined in the Ambient Air Standards compared to the Emissions Standards. The probability of obtaining such an exemption is not known; but, Legal Department personnel are being consulted at this time in an effort to determine what approach should be used. In the meantime engineering efforts are being directed toward determining the most acceptable solutions and the associated costs. If attempts to obtain a waiver are unsuccessful, money for revisions will have to be committed in 1974 in order to meet the June, 1975 compliance date. Compliance by this date could be very difficult depending on the extent of revisions needed.

R. D. Gamblin

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FK-JDBr-LNV-RHG-TJG-RSM
GGD-JRH-LNW-JCL-JDM-DCS-PLF

CWH 000006621

1974 CAPITAL BUDGET SUMMARY

LAKE CHARLES VCM PLANT

	<u>Capital (\$)</u>
<u>Plant Expansion and Modernization</u>	0
<u>Product Improvement</u>	0
<u>Cost Savings</u>	
V-1 Residual Chlorine Reactor	40,000
V-2 Acetylene Hydrogenator	\$125,000 Capital
	<u>75,000</u> Licensing Fee
V-3 Oxychlorination On-Stream Analyzer	200,000
	<u>25,000</u>
Subtotal	\$ 265,000
<u>Pollution Abatement</u>	
V-4 Effluent Water Filter	100,000
V-5 Additional Tars Storage	<u>50,000</u>
Subtotal	\$ 150,000
<u>Safety</u>	
V-6 Maintenance Building Modification	25,000
<u>Miscellaneous</u>	
V-7 Moisture Analyzers	35,000
V-8 Critical Equipment Replacement	95,000
V-9 Miscellaneous Items Under \$2,500	20,000
V-10 Laboratory Instruments	11,000
V-11 Maintenance Tools	<u>8,000</u>
Subtotal	\$ 169,000
GRAND TOTAL	<u>\$ 609,000</u>
<u>Memorandum Items</u>	
V-1M VCM Quality Improvement	145,000
V-2M Chlorine Scrubbing System	212,000
V-3M Tars Disposal System	2,650,000
V-4M Louisiana Ambient Air Standards Compliance	2,700,000
V-5M Additional Liquid Chlorine Unloading Facilities	<u>35,000</u>
TOTAL	<u>\$5,742,000</u>

CWH 000006622

1974 CAPITAL BUDGET

CASH FLOW SUMMARY

(Cash Flows in M\$)

PROJECT YEAR	<u>0</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>
Project											
V-1	(40.0)	18.2	20.5	23.0	24.6	25.2	25.9	26.5	21.8	22.2	26.4
V-2	(200.0)	65.2	71.3	74.8	74.8	74.2	53.8	58.4	46.1	48.0	61.9
V-3	(25.0)	19.9	19.9	19.9	19.9	19.9	19.9	19.9	15.1	15.1	17.0
Subtotal	(265.0)	103.3	111.7	117.7	119.3	119.3	99.6	104.8	83.0	85.3	105.3
DCF, %						49.6					
V-4	(25.0)	0.6	0.6	0.6	0.6	0.6	0.6	0.6	1.0	1.0	1.9
V-5	(100.0)	2.2	2.2	2.2	2.2	2.2	2.2	2.2	4.1	4.1	8.2
V-6	(50.0)	1.1	1.1	1.1	1.1	1.1	1.1	1.1	2.1	2.1	3.9
V-7	(35.0)	0.8	0.8	0.8	0.8	0.8	0.8	0.8	1.4	1.4	2.8
V-8	(95.0)	2.1	2.1	2.1	2.1	2.1	2.1	2.1	3.9	3.9	7.9
V-9	(20.0)	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.8	0.8	1.7
V-10	(11.0)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.5	0.5	0.9
V-11	(8.0)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.8
Subtotal	(344.0)	7.6	7.6	7.6	7.6	7.6	7.6	7.6	14.1	14.1	28.1
DCF, %						0.0					
Total	(609.0)	110.9	119.3	125.3	126.9	126.9	107.2	112.4	97.1	99.4	133.4
DCF, %						16.0					

CUH 000006623

1974 CAPITAL BUDGET

Lake Charles VCM Plant

V-1

RESIDUAL CHLORINE REACTOR

\$40,000 Capital $\pm$ 15%

Project Description

1. A new carbon steel packed reactor will be built to react excess chlorine in the R-101 crude with ethylene.
2. New pumps will be installed to feed EDC to the new reactor and to transfer EDC from the new reactor to the acid wash vessel.
3. Associated reactor control instrumentation and emergency shutdown controls will be installed.
4. Experience by other Stauffer Licensees has shown that 90% of the excess chlorine is recoverable without increasing ethylene losses.

Problem Description

Presently approximately 1450 pounds per day of chlorine leaves R-101 unreacted and is lost by neutralization in the caustic wash. This results in poorer plant chlorine efficiency and increased caustic consumption. This problem is accentuated during periods when chlorine is in tight supply and recovered chlorine could be used to produce incremental VCM for sales.

Alternatives

No other alternatives for chlorine recovery are presently available.

Project Economics Summary

Savings of \$30,300 per year (escalated over the ten year project life to \$45,600 per year based on chlorine prices) are estimated as a result of increased chlorine recovery and decreased caustic consumption. This expenditure has a discounted payout period of 2.3 years with a 10 year DCF return of 67.1%. This project will have a 10 year DCF return of greater than 95% with a tight chlorine market during the first two project years.

CWH 000006624

RESIDUAL CL2 REACTOR (V-1)

CALCULATION OF PROJECT ECONOMICS

PROJECT YEAR	<u>0</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>
REVENUES, M\$											
Cl ₂ & NaOH Savings		30.3	33.3	36.6	38.7	39.5	40.4	41.3	44.2	44.9	45.6
COSTS, M\$											
Maintenance & Operating Costs		7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Depreciation		3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Insurance and Taxes		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
TAXABLE INCOME, M\$		19.2	22.2	25.5	27.6	28.4	29.3	30.2	33.1	33.8	30.5
INCOME TAX, M\$		<u>4.6</u>	<u>5.3</u>	<u>6.1</u>	<u>6.6</u>	<u>6.8</u>	<u>7.0</u>	<u>7.3</u>	<u>14.9</u>	<u>15.2</u>	<u>13.7</u>
AFTER-TAX INCOME, M\$		14.6	16.9	19.4	21.0	21.6	22.3	22.9	18.2	18.6	16.8
DEPRECIATION, M\$		<u>3.6</u>	<u>3.6</u>	<u>3.6</u>	<u>3.6</u>	<u>3.6</u>	<u>3.6</u>	<u>3.6</u>	<u>3.6</u>	<u>3.6</u>	<u>7.6</u>
OPERATING CASH FLOW, M\$		18.2	20.5	23.0	24.6	25.2	25.9	26.5	21.8	22.2	24.4
INVESTMENT, M\$	(\$40)										
SALVAGE VALUE, M\$											<u>2</u>
NET CASH FLOW, M\$	(\$40)	18.2	20.5	23.0	24.6	25.2	25.9	26.5	21.8	22.2	26.4
DCF, %	67.1										
DISCOUNTED PAYOUT PERIOD, Years	2.3										

CWH 000006625

RESIDUAL CHLORINE REACTOR (V-1)
PROJECT ECONOMICS SENSITIVITY ANALYSIS

Base Case: Capital Commitment: \$40,000 DCF Return: 67.1%

Possible Variance

Credit for incremental VCM production during a tight chlorine market (valued at \$0.02 per pound netback) was taken during first two project years. The DCF return is improved to greater than 95%.

CWH 000006626

RESIDUAL CHLORINE REACTOR (V-1)

PROJECT ECONOMICS ASSUMPTIONS

Revenues

1. Chlorine and caustic prices based on projected chlorine prices by W. F. Revelt, Ponca City, 6-13-73.
2. Chlorine savings of 1300 pounds recovered chlorine per day and caustic savings of 1500 pounds unused caustic per day. Valued at \$30,300 in year one escalated to \$45,600 in year ten.

Costs

1. Maintenance - Assume 5% of construction capital.
2. Operating Costs - Estimated at \$5,000 per year.
3. Insurance and Taxes - Assume 1.25% of construction capital (plant experience)

Other

1. Salvage Value - Assume 5% of construction capital.

CWH 000006627

1974 CAPITAL BUDGET

Lake Charles VCM Plant

V-2

ACETYLENE HYDROGENATOR

\$125,000	Capital + 15%
75,000	License Fee
<u>\$200,000</u>	

Project Description

This project consists of a reactor that will hydrogenate the acetylene in the HCl feed to Oxy. The reactor will be licensed from and designed by B.F. Goodrich Chemical Company, who utilize this process in all of their own and licensees' plants. This process has never been combined with a Stauffer Oxy unit and to that extent, is somewhat speculative. However, the principle is well established and should apply equally well to a Stauffer unit. The license fee is estimated at \$75,000.

Hydrogen for the process will be byproduct hydrogen from the ethylene plant. The HCl will be pure enough for the MeCl plant to use without their having to strip out byproducts.

Problem Description

Acetylene is formed as a byproduct in the cracking furnaces. It then goes into the Oxy reactors with the HCl from cracking. In Oxy it reacts to form cis and trans dichloroethylene, trichloroethylene, perchloroethylene, and tetrachloroethane. These reactions consume an estimated 2.91 MM pounds per year of HCl that would otherwise be reacted to form EDC. The by-products end up in the waste streams and must be disposed of. It is estimated that the tars will be reduced by 906 tons per year and light ends by 1120 tons per year.

When Cl₂ is in short supply the HCl reacting to form byproducts reduces vinyl production. The HCl recovered would yield 4.5 MM lbs. of incremental vinyl production.

Alternatives

No alternatives were considered.

Project Economics Summary

CWH 000006628

Savings of \$127,500 per year are estimated for the first project year and escalate to \$151,000 for the tenth project year. The investment of \$125,000 construction capital and \$75,000 licensing fee has a 3.3 year discounted payout period with a 10 year DCF return of 38.2%. This project will have a 10 year DCF return of 80% with a tight chlorine market during the first and second project years.

ACETYLENE HYDROGENATOR (V-2)

CALCULATION OF PROJECT ECONOMICS

PROJECT YEAR	<u>0</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>
REVENUES, M\$											
HCI Savings		97.5	107.1	113.3	115.6	118.2	120.9	129.4	131.3	137.6	141.1
Tars Disposal Savings		27.2	27.2	27.2	27.2	27.2	0	0	0	0	0
EDC in Tars Savings		11.9	12.7	13.4	13.7	13.9	14.3	15.2	15.4	16.2	16.5
Light Ends Lost		(16.1)	(16.1)	(16.1)	(16.1)	(16.1)	(16.1)	(16.1)	(16.1)	(16.1)	(16.1)
EDC in Light Ends		7.0	7.3	7.7	7.8	8.1	8.2	8.8	8.9	9.3	9.5
Total		<u>127.5</u>	<u>138.2</u>	<u>145.5</u>	<u>148.2</u>	<u>151.3</u>	<u>127.3</u>	<u>137.3</u>	<u>139.5</u>	<u>147.0</u>	<u>151.0</u>
COSTS, M\$											
Maintenance		8.1	8.6	9.1	9.6	10.2	10.8	11.4	12.1	12.8	13.6
Insurance and Taxes		1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
Hydrogen		3.5	3.7	3.9	4.1	4.3	4.6	4.9	5.2	5.5	5.8
Catalyst		34.0	36.0	38.0	40.0	43.0	45.0	48.0	51.0	54.0	57.0
Depreciation		17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	34.3
Total		<u>64.5</u>	<u>67.2</u>	<u>69.9</u>	<u>72.6</u>	<u>76.4</u>	<u>79.3</u>	<u>83.2</u>	<u>87.2</u>	<u>91.2</u>	<u>112.3</u>
TAXABLE INCOME, M\$		63.0	71.0	75.6	75.6	74.9	48.0	54.1	52.3	55.8	38.7
INCOME TAX, M\$		15.1	17.0	18.1	18.1	18.0	11.5	13.0	23.5	25.1	17.4
AFTER-TAX INCOME, M\$		<u>47.9</u>	<u>54.0</u>	<u>57.5</u>	<u>57.5</u>	<u>56.9</u>	<u>36.5</u>	<u>41.1</u>	<u>28.8</u>	<u>30.7</u>	<u>21.3</u>
OPERATING CASH FLOW, M\$		65.2	71.3	74.8	74.8	74.2	53.8	58.4	46.1	48.0	55.6
INVESTMENTS, M\$											
Capital	(125.0)										
Licensing Fee	(75.0)										
WORKING CAPITAL, M\$	0										
SALVAGE VALUE, M\$											6.3
NET CASH FLOW, M\$	(200.0)	65.2	71.3	74.8	74.8	74.2	53.8	58.4	46.1	48.0	61.9
DCF RETURN, %					38.2%						
DISCOUNTED PAYOUT PERIOD, Yrs.					3.3 Yrs.						

CUM 000006629

ACETYLENE HYDROGENATOR
PROJECT ECONOMICS SENSITIVITY ANALYSIS

(1) Base Case: Commitment: \$200,000 DCF Return: 38.2%

<u>Possible Variances</u>		<u>% DCF Return</u>	
<u>Minus</u>	<u>Plus</u>	<u>Impaired To</u>	<u>Improved To</u>
15%	20%		
(2)	(4)		
	Capital Commitment	29.0%	48.3%
	Revenue	21.9%	74.1%
	24% Tax Rate Over Entire Period	-	38.8%
	(3) Chlorine Supply Limiting VCM	-	80.0%
	Production		
	Combination	15.2%	> 95%

- (1) This assumes that 70% of the acetylene is reacted.
- (2) This is based on a 20% reduction in the conversion of acetylene from the base case.
- (3) This assumes that the chlorine supply limits vinyl production in the first and second project years.
- (4) This assumes that all of the acetylene present in the HCl gas reacts.

ACETYLENE HYDROGENATOR (V-2)

PROJECT ECONOMICS ASSUMPTIONS

Revenues

1. HCl Savings - It was estimated that 3.645 pounds of HCl react to form by-products per pound of acetylene in the HCl feed to Oxy. This amounts to an annual saving of 2.91 MM pounds per year of HCl. The value of HCl was escalated as shown in Table I. Acetylene was taken as 2700 ppm in the HCl feed (plant experience).
2. Tars Disposal Savings - Based on negotiations with PPG Industries a tars disposal cost of \$30 per ton was used. It is estimated that the installation of this project will reduce tars production by 906 tons per year. Disposal by Rollins-Purle would cost \$60-\$90 per ton. It was assumed that after the fifth project year a process would be installed that would dispose of tars at a zero net cost.
3. EDC in Tars Saving - There is approximately 15% EDC in the tars. The reduction by 906 tons per year in tar production results in a 272 M pound reduction in EDC losses. The value of EDC was escalated as shown in Table I.
4. Light Ends Loss - The removal of acetylene results in a 2.24 MM pound per year reduction in the formation of light ends by-product. Presently the light ends are sold to Vulcan Corporation at a netback of 0.72¢/lb. This results in a revenue loss of \$16 M per year.
5. EDC in Light Ends - At a 7% concentration of EDC in light ends, EDC losses are reduced by 157 M pounds per year. EDC cost escalation is shown in Table I.

Costs

1. Maintenance - Assume 6.5% of Construction Capital per year (plant experience).
2. Taxes and Insurance - Assume 1.25% of Construction Capital per year (plant experience).
3. Hydrogen - Assume 1.93¢/lb. (1973 ALFOL Blue Book value) escalating at 6% per year.
4. No running royalty will be required. A \$75,000 licensing fee is included in the capital investment.

CWH 000006631

5. Catalyst - This was taken at B.F. Goodrich Chemical Company guaranteed consumption rate. The price used was \$ 151,00/ft.³ (supplied by B.F. Goodrich) escalating at 6% per year.

Other

1. Salvage Value - Assume 5% of Construction Capital (arbitrary).
2. Startup Date - 1/1/75

CWH 000006632

TABLE I
EDC AND HCl ESCALATION

<u>Raw Material</u>	<u>Units</u>	<u>Units/lb.</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	
Chlorine	Lbs.	0.3913	3.4498	3.7896	4.0066	4.0908	4.182	4.2786	4.578	4.6476	4.88	5.0	¢/unit
Ethylene	Lbs.	0.3037	5.0868	5.4739	5.6868	5.7868	5.8967	6.0035	6.3432	6.4291	6.60	6.80	¢/unit
HCl	Lbs.	0.3616	3.3553	3.6858	3.8968	3.9787	4.0674	4.1614	4.4526	4.5203	4.746	4.863	¢/unit
<u>Processing Supplies</u> (¢/lb.)			0.0559	0.0593	0.0629	0.0667	0.0707	0.0749	0.0794	0.0842	0.0893	0.0947	
<u>Utilities</u>													
Electricity	KWH	0.04466	1.188	1.3193	1.4596	1.4826	1.574	1.5978	1.7944	1.8067	1.9	2.0	¢/unit
Water	M gal.	0.00036	2.9	3.08	3.26	3.46	3.67	3.89	4.12	4.37	4.63	4.91	¢/unit
Steam	M lbs.	0.0006	91.01	108.94	119.46	122.53	125.63	128.72	143.73	145.33	147.0	149.0	¢/unit
Fuel Gas	MSCF	0.000052	67.62	79.05	85.71	87.62	89.52	91.4	100.95	101.9	103	105	¢/unit
EDC ¢/lb.			4.379	4.667	4.909	5.009	5.120	5.232	5.580	5.664	5.942	6.061	

Basis: Interoffice Communication: W. F. Revelt to C. L. Sanderson, "Projected Costs for the VCM Expansion Study", 6/13/73

Assumptions:

1. HCl value was taken as 0.9726 x chlorine value.
2. Processing supplies were taken as 0.0497¢/lb. (1973 VCM Variable Cost Standard) and escalated at 6% per year.

CUH 000006633

1974 CAPITAL BUDGET

Lake Charles VCM Plant

V-3

OXYCHLORINATION ON-STREAM ANALYZER

\$25,000 Capital $\pm$ 15%

Project Description

1. An on-stream process gas chromatograph will be installed to monitor reaction progress through the primary oxychlorination reactors. One analyzer with stream switching capability will analyze the outlets of R-301, R-302, and R-303.
2. A control room board mounted recorder will be installed to monitor reactor performance.

Problem Description

Presently the primary oxy reactors are controlled by monitoring unconverted acid strength and oxychlorination vent percent ethylene. Hot spot temperatures and steam make are used to adjust air splits between individual reactors to control reaction progress. There are only four thermowell tubes in each reactor of 5820 tubes. Because of flow differences these tubes give at best only a rough indication of reactor progress. Steam make readings because of variation in flow instruments between each reactor are again at best only a rough indication of reaction progress.

The on-stream analyzer will provide an accurate overall picture of reaction progress enabling adjustment of air flows to each reactor to optimize reactor efficiency, minimize by-product formation, and prolong catalyst life. In addition, this analyzer will provide valuable data on the oxychlorination process, assist in reactor stabilization during startup, and will be of particular importance if a switch to BASF catalyst is made. There is also a strong potential for reduction of by-products.

Alternatives

Besides the chosen project, other possible alternatives which might provide a solution to the problem were considered and rejected. These alternatives include:

1. Addition of thermowell tubes - While providing more data, these would not show overall reactor effectiveness.
2. Sample taps for lab analysis - Because of sample condensation and further reaction due to time delays, reliable laboratory analysis is not possible.

CWM 000006634

Project Economics Summary

Savings of \$28,800 per year are expected if catalyst runs can be increased by 7 days due to increased reactor effectiveness. This expenditure has a discounted payout period of 1.3 years with an 10 year DCF return of greater than 95%. Reductions of 5% and 10% in by-products of ethyl chloride and carbon oxides, respectively, will result in annual savings of \$17,000.

CWH 000006635

OXYCHLORINATION ON-STREAM ANALYZER (V-3)

CALCULATION OF PROJECT ECONOMICS

PROJECT YEAR	<u>0</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>
REVENUES, M\$		28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8
COSTS, M\$											
Depreciation		2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	4.3
Maintenance Expense		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Insurance and Taxes		0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
TAXABLE INCOME, M\$		23.2	23.2	23.2	23.2	23.2	23.2	23.2	23.2	23.2	21.2
INCOME TAX, M\$		5.6	5.6	5.6	5.6	5.6	5.6	5.6	10.4	10.4	9.5
AFTER-TAX INCOME, M\$		17.6	17.6	17.6	17.6	17.6	17.6	17.6	12.8	12.8	11.7
DEPRECIATION, M\$		2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	4.3
OPERATING CASH FLOW, M\$		19.9	19.9	19.9	19.9	19.9	19.9	19.9	15.1	15.1	16.0
INVESTMENT, M\$	(25)										
SALVAGE VALUE, M\$											1.0
NET CASH FLOW, M\$	(25)	19.9	19.9	19.9	19.9	19.9	19.9	19.9	15.1	15.1	17.0
DCF RETURN, %	> 95										
DISCOUNTED PAYOUT PERIOD, Yrs.	1.3										

929900000 HMD

OXYCHLORINATION ON-STREAM ANALYZER (V-3)

PROJECT ECONOMICS SENSITIVITY ANALYSIS

Base Case: Capital Commitment: \$25,000 DCF Return: > 95%

<u>Possible Variances</u>		<u>% DCF Return</u>	
<u>Minus</u>	<u>Plus</u>	<u>Impaired To</u>	<u>Improved To</u>
.5%	0	a) Ethyl Chloride Production	> 95%
10%	0	b) Reaction Overburning	> 95%
70%	0	c) Increased Run Time Between Catalyst Changeouts	> 95%

- a) Reduction of by-product ethyl chloride by 190,000 pounds will result in \$6,100 savings per year as chlorine and ethylene.
- b) Reduction of reaction overburning will result in ethylene savings of \$11,000 per year.
- c) Increased run time of only two days versus seven day base case.

CWH 000006637

1974 CAPITAL BUDGET

Lake Charles VCM Plant

V-4

EFFLUENT WATER FILTER

\$100,000 Capital + 15%

Project Description

1. A single pressure filter sized for 600 gpm maximum.
2. A 600 gpm pump rated for 35 psig discharge and self-priming construction. This pump will have a flow control valve on its discharge controlled by a water level sensor in the pump suction basin.

Problem Description

Recently proposed EPA regulations for chemical plant effluent water streams require that the VCM Plant not exceed 60 ppm of suspended solids in its effluent. Since present suspended solids levels are over 300 ppm, some type of solids removal device will be needed if these regulations are adopted. The best method appears to be a granular media, pressure filter which is backwashed with air and water. Several companies make such units in standard skid-mounted packages. Installation of one of these units should reduce suspended solids to about 25 ppm which will satisfy the EPA rules with a fairly good safety factor. Solids backwashed from the filter will be sent to either the sludge holding basin or the aerated basins depending on operating conditions. Only a single filter unit will be used; the level of the reaeration basin will be allowed to rise during backwash periods so that a spare filter is not needed. Flow to the filter will be controlled by a level sensor in the reaeration basin which will control an electronic control valve on the discharge of the filter feed pump.

Pilot studies on this type of filter will begin in fall of 1973. This project will be AFE'd only when final EPA regulations make installation necessary.

Alternatives

Other methods of solids removal are a large settling basin, centrifuges, vacuum filtration, or simple sand filters. Due to the low flow rate and the solids concentration, a granular media filter is the most economical choice.

Project Economics Summary

No project economics are calculated, since this project is being installed solely for pollution control and has no cost savings features.

CWH 000006638

1974 CAPITAL BUDGET

Lake Charles VCM Plant

V-5

ADDITIONAL TARS STORAGE

\$50,000 Capital + 15%

Project Description

1. A new 4,000 Bbl. tank will be built, thus increasing in-plant tar storage by 36 days.
2. The new tars tank will be tied into existing piping so that present loading facilities will be utilized for all tars storage.

Problem Description

A proposed tars disposal contract between Conoco and PPG provides for PPG's disposal of VCM Plant tars in their process units. Existing in-plant tar storage is presently only 1400 Bbl. or 13 days storage. An outage by PPG of greater than 13 days would create a serious tars disposal problem. The addition of a 4,000 Bbl. storage tank will provide an additional 36 days in-plant storage. This added storage will provide a sufficient safety margin, in the event of a PPG shutdown, to allow PPG to start up again or to activate alternative disposal methods.

This project will be needed even if the disposal contract with PPG is finalized. PPG will not assure adequate tars storage in the event of downtime within their process units. Also, this additional storage would be needed to provide time for maintenance if any of the several tars disposal methods, i.e. Transcat, Ucar, Catoxide, etc. are adopted.

Alternatives

Besides the chosen project, other possible alternatives which might provide a solution to the problem were considered and rejected. These alternatives include:

1. Obtain additional storage when the problem presents itself. Timing and availability of outside storage are the main drawbacks. Plant experience has shown that preparing additional storage requires a minimum of two weeks time. Preparation costs for two storage tanks were approximately \$15,000 and for barge storage were approximately \$25,000.
2. Lease additional storage now. Tank modifications, N₂ purging costs, N₂ pad costs, transportation costs, and safety make this an unattractive long term alternative. Rental costs currently are \$2,400/month for two storage tanks and \$3,800/month for barge storage, plus nitrogen and handling costs.

CWH 000006639

3. Dumping in open pits. This alternative is ecologically unsound.

Project Economics Summary

No economics are computed on this item.

CWH 000006640

1974 CAPITAL BUDGET

Lake Charles VCM Plant

V-6

MAINTENANCE BUILDING MODIFICATION

\$25,000 Capital + 15%

Project Description

The Maintenance Building modification consists of extending the present building 20 feet east, the full 80 foot length of the building. One third of the new area will be used as an extension of the present tool room; one third for rigging and ladder storage; and one third for electrical shop use in motor handling and baking. Concrete block walls and strength members matching the existing building will be used. Four 8' x 10' rollup metal doors and two 3' x 6'-8" walk through doors will be installed.

Problem Description

1. The VCM Plant's internal OSHA inspection has shown that the plant's tool room is too small to provide safe storage of plant maintenance equipment. The tool room has no adequate space in which to store rigging equipment and ladders (both items by OSHA regulations must be protected from the environment). Tool room shelving on which to properly store other maintenance tools for safe and efficient issue and return is presently limited.
2. The electrical shop presently has no capability to handle large motors during repairs. The electricians must now use other areas of the plant, where proper maintenance equipment is not available.

Alternatives

No other alternatives are available.

Project Economics Summary

No economics are calculated on this project.

CWH 000006641

1974 CAPITAL BUDGET

Lake Charles VCM Plant

V-7

MOISTURE ANALYZERS

\$35,000 Capital $\pm$ 15%

Project Description

1. One infrared moisture analyzer with stream switching capability will be installed to monitor water content in the heavy ends column feed and reflux.
2. One infrared moisture analyzer with stream switching capability will be installed on the outlets of the two EDC vaporizers (H-201A&B).
3. High water alarms will be installed on these analyzers.

Problem Description

Presently the heavy ends column reflux is analyzed for water in the laboratory four times per shift and the vaporizer feed is analyzed once per day. The maximum water content allowed in EDC is 50 parts per million. If water concentration exceeds this amount for extended periods, equipment in the EDC cracking area will be seriously damaged.

The heavy ends column condenser has developed tube leaks twice this year. The time spent in location of these minor leaks could have been significantly reduced with an on-stream analyzer. They will allow more reliable leakage trend data to be developed and analyzed for leak locations. VCM production rates were reduced twice this year because excessive time was necessary to locate minor tube leaks in the heavy ends column condenser. Resultant vinyl loss was 1.1 MM pounds in these instances and in the future, this would be greater because of the 730 MM pound per year projected production rates will require maximum output from the EDC purification section. Major leaks, should they occur would be detected almost instantaneously and alarmed by the analyzer.

Potential tube leaks in the EDC vaporizers have been detected by ultrasensitive helium methods during turnarounds. These leaks could have enlarged, if not detected in time. The potential for severe damage to the furnaces and quench columns with even minor leaks in these exchangers is great. Presently no reliable analytical technique is available other than an on-stream analyzer for measurement of water in the vaporizer outlet stream.

Alternatives

Alternatives, including aluminum oxide sensors and process gas chromatographs have been rejected because of reliability and maintenance cost compared to that of infra-red units.

Project Economics Summary

No economics are calculated on this project. However, severe damage to the cracking area could cause weeks of downtime for repair and replacement of equipment; and excessive time spent in location of minor leaks will result in significant losses in VCM production at the 730 MM pounds per year production rates.

CWH 000006643

1974 CAPITAL BUDGET

Lake Charles VCM Plant

V-8

CRITICAL EQUIPMENT REPLACEMENT

\$95,000 Capital + 15%

Project Description

This item provides funds to purchase replacement items for the following equipment:

1. Vinyl Caustic Dryers
2. Heavy Ends Column Condenser
3. Acid Wash System Overflow Drum
4. Reactor Crude EDC Tank

Problem Description

1. Vinyl Caustic Dryers - A solution of 50% caustic accumulates in the steam traced bottom heads of these dryers. Over the years, caustic corrosion has reduced the head thickness. This is being closely monitored. At the present corrosion rate these vessels will require replacement within the next two years. Due to the long delivery time expected for these vessels, funds are being requested in 1974 so that the vessels will be available in late 1974 or early 1975 when their replacement is anticipated.

The replacement vessels will have a Monel clad bottom head that will eliminate the caustic corrosion problem. The new dryers will be sized to handle the rates expected from a major expansion.

2. Heavy Ends Column Condenser - This exchanger has been the cause of several shutdowns of the EDC section over the past two years. In addition, 1.1 MM lbs. of vinyl production have been lost to date this year due to these shutdowns. The replacement exchanger will be purchased in anticipation of a major failure of the exchanger.
3. Acid Wash Overflow Drum - This is a glass-lined vessel that separates EDC from the spent acid stream. It has had to be repaired several times since its installation. Plant experience has shown that glass-lined vessels have a limited life in this service. Failure of this vessel would result in significant EDC losses and overloading of the plant's secondary treatment system.
4. Reactor Crude EDC Tank - Inspection of this vessel during the recent turnaround showed an area of severe corrosion. It is anticipated that this vessel will have to be replaced in early 1975.

CWH 000006644

Alternatives

No alternatives were considered.

Project Economics Summary

No conventional economics can be calculated for this item. If these vessels fail the following would result:

1. Failure of the Heavy Ends Condenser - This would result in a loss of 10-15 MM pounds of vinyl production before a temporary replacement could be installed.
2. Failure of the Acid Wash Overflow Drum - This would result in EDC losses of \$3,000-\$5,000 per month in addition to severely overloading the secondary treatment system.

CWH 000006645

1974 CAPITAL BUDGET

Lake Charles VCM Plant

V-9

MISCELLANEOUS ITEMS UNDER \$2500

\$20,000 Capital

Project Description

Typical items included in this miscellaneous category are minor equipment additions, additional safety equipment and additions to laboratory equipment.

Problem Description

This item provides funds for miscellaneous small projects which will be required in 1974, but which cannot be defined at this time.

Budget History

Approved Budget (\$)		
1971	1972	1973
20,000	20,000	20,000
Actual Expenditures (\$)		
10,381	19,538	

Project Economics Summary

No project economics are computed on this item.

CWH 000006646

1974 CAPITAL BUDGET

Lake Charles VCM Plant

V-10

LABORATORY INSTRUMENTS

\$11,000 Capital $\pm$ 15%

Project Description

Control Laboratory

Funds are requested for the purchase of two recorders, Hewlett-Packard Model 7123A with appropriate optional equipment (\$2,300), two System IV channel modules (\$5,200), a pH meter, Orion Model 701 (\$750) and a conductivity meter - Lab Line Model Mark IV (\$390).

Manufacturing Laboratory

Funds are requested for the purchase of a multi-point temperature recorder with appropriate accessories, Honeywell Class Electronic 112, Model 112-40180-53020-00000-00-00-106-18 (\$1,650).

Problem Description

Control Laboratory

The channel modules will replace two integrators which have been used in the lab since plant startup. The new recorders will also be replacement equipment with the older equipment being used as auxiliary backup equipment. The pH meter and conductivity instruments would be used in a proposed satellite lab in the control room.

Manufacturing Laboratory

Work conducted this past year indicates that a multipoint temperature recorder is needed to adequately follow and control lab bench-scale pilot processes.

Budget History

CWH 000006647

	Approved Budget (\$)		
	1971	1972	1973
Control Laboratory	7,500	8,500	16,000
Manufacturing Laboratory	23,000	-	-
Total	30,500	8,500	16,000

	Actual Expenditure		
	1971	1972	1973
Control Laboratory	7,400	8,373.33	15,572.08
Manufacturing Laboratory	23,044.61	-	-
Total	30,444.61	8,373.33	15,572.08

Project Economics Summary

No project economics are computed on this project.

CWH 000006648

1974 CAPITAL BUDGET

Lake Charles VCM Plant

V-11

MAINTENANCE TOOLS

\$8,000 Capital $\pm$ 15%

Project Description

The following maintenance tools are to be purchased:

1. 500-600 V Hand Driven Biddle Megger	500
2. Porta-Band Saw	350
3. Right Angle Drill	150
4. Bake Oven for Motors	3,100
5. Audio - Signal Generator	200
6. Roto-Rooter Drain Cleaning Machine	175
7. Wheatstone Bridge	500
8. Abrasive Cutting Machine	1,500
9. 12 Sections 5 ft. Frame Scaffolding w/Hardware	750
10. 100 ft. Tubular Scaffolding w/Hardware	775

These tools are expected to increase the maintenance force's efficiency and also to give it increased capabilities.

Problem Description

The additional maintenance tools are needed by the Mechanical Department in order to eliminate problems which have occurred in the past year and which are expected to reoccur in the future.

CWH 000006649

Budget History

Approved Budget (\$)		
1971	1972	1973
5,900	0	0
Actual Expenditures (\$)		
5,848	0	0

Project Economics Summary

No project economics are computed on this item.

CWH 000006650

1974 CAPITAL BUDGET

Lake Charles VCM Plant

V- 1M

VCM QUALITY IMPROVEMENT

\$145,000 Capital

Project Description

The existing EDC caustic wash will be converted to a two stage counter-current system. The following equipment will be added:

1. New caustic wash mixing drum
2. New caustic/EDC separator drum
3. EDC transfer pumps
4. Caustic transfer pump.

The counter-current operation will allow the EDC to be treated with high strength caustic. This treatment removes VCM impurity precursors in the EDC feed. This operation will result in no significant increase in operating costs.

It is estimated that the existing production of 6-10 ppm butadiene and 50-100 ppm methyl chloride would be reduced to less than 7 ppm butadiene and less than 40 ppm methyl chloride.

Problem Description

It is anticipated that the amount of butadiene and methyl chloride in our monomer must be reduced in order to remain competitive in the market. This premise must be confirmed through marketing.

Alternatives

1. Increasing the caustic outlet strength of the existing wash. This has been done already to some extent. It is estimated that the increase in outlet strength required to achieve the quality improvement of this project would result in an expenditure of \$100,000 per year extra for 50% caustic solution.
2. Fractionation of methyl chloride and butadiene - The capital required and the increased loss of vinyl make this economically prohibitive.

Project Economics Summary

No project economics were computed on this item.

CWH 000006651

1974 CAPITAL BUDGET

Lake Charles VCM Plant

V-2M

CHLORINE SCRUBBING SYSTEM

\$212,000 Capital

Project Description

1. A new 8 1/2' x 18' caustic, brick-lined, packed scrubbing column will be built to reduce the chlorine content of the plant effluent gas stream to within proposed state and federal oxidant standards.
2. The scrubbing liquid will be 2% caustic; a feed system for 50% caustic and a recirculation system for 2% caustic will be provided.

The scrubbing column is sized to reduce a 20,000 SCFM plant effluent gas stream from 800 ppm to less than 100 ppm chlorine.

Problem Description

The average amount of chlorine in the VCM Plant vent gas stream has been measured to be approximately 800 ppm. At certain times and under certain weather conditions, the chlorine concentration has been enough to cause ground level odor and nuisance problems in the neighborhood, which has resulted in various complaints to the plant. The standards for chlorine are not yet set. However, using one type of analysis, chlorine may be considered an oxidant, which will necessitate reducing the chlorine content in the effluent gas stream to 100 ppm to satisfy proposed ambient air standards in the state of Louisiana. The classification of chlorine is not yet finalized.

Alternatives

1. The addition of a R-305 cleanup reactor and a scrubbing system to remove chlorine, ethylene, and EDC are being considered, but at a much greater capital investment. Budget capital commitment will be estimated upon completion of the process design by PED.
2. Revisions of the R-304 cooling system to allow higher reaction temperatures. Design of this system is currently underway. The practicality of this solution is not well established at this time. Estimated capital - \$100,000.
3. A spray tower scrubber and a venturi scrubber were also considered, but are not efficient enough to get less than 100 ppm chlorine in the effluent gas.

CWH 000006652

Project Economics Summary

Costs

Caustic Usage	\$45,000/year (750 tons NaOH/year)
Maintenance	10,000/year
Insurance and Taxes	5,000/year
Horsepower (15 HP)	1,000/year
Total	<u>\$61,000/year</u>

There is no return on investment because this is a pollution abatement project.

CWH 000006653

1974 CAPITAL BUDGET

Lake Charles VCM Plant

V-3M

TARS DISPOSAL SYSTEM

\$2,650,000 Capital

Project Description

The most economical tars disposal system will be installed to handle VCM Plant by-product tars.

Problem Description

Presently the VCM Plant produces a by-product tars stream (heavier than EDC chlorinated compounds) which have no value unless further processed. Environmental regulations no longer permit open pit dumping of the 18 MM pound per year tars stream as was done in previous years by an outside firm for the VCM Plant. Plant tars are now stored in leased storage tanks, at a cost of over \$6,000 per month in storage cost alone, awaiting possible disposal contracts with other firms. We are currently negotiating with PPG for disposal of tars. If a contract is signed, this item will not be needed.

Alternatives

The following alternatives are being considered:

1. Disposal by PPG - \$270,000 per year plus handling costs.
2. Disposal by an outside incineration firm - \$400,000 to \$800,000 per year plus handling costs.
3. Long term salt dome storage - \$110,000 capital + \$120,000 per year shipping costs. Project life - 5 years.
4. Distillation plus long term salt dome storage - \$510,000 capital + \$100,000 per year operating and shipping costs. Project life - 20 years.
5. In-plant incineration with HCl recovery - \$2,250,000 capital + \$525,000 per year operating costs.
6. In-plant distillation + incineration with HCl recovery - \$2,650,000 capital + \$ 525,000 per year operating costs.

CWH 000006654

7. Construction of a Lummus "Transcat" process unit with the following options:
 - a) Designed for disposal of only tars and light ends.
 - b) Designed for disposal of tars and light ends and a 300 MM pounds per year VCM Plant expansion.
 - c) Designed for disposal of tars and light ends and the elimination of the existing oxychlorination unit.
8. Construction of a B.F. Goodrich "Catoxid" unit with a VCM Plant expansion using B.F. Goodrich oxychlorination technology.

Note: Items 3 and 4 only delay final disposal by another method.

Note: Items 5, 6, 7 and 8 will be designed to handle the plant's light ends by product stream in the event of cancellation of an existing disposal contract.

Note: Anhydrous HCl from Items 5 and 6 could be used in both oxychlorination and the Methyl Chloride Plant.

Project Economics Summary

No economics are calculated on this project.

CWH 000006655

1974 CAPITAL BUDGET

Lake Charles VCM Plant

V-4M

LOUISIANA AMBIENT AIR STANDARDS COMPLIANCE

\$2,700,000

Project Description

This project is currently ill-defined. The capital requirements are only very preliminary estimates and will be further defined as the scope and processes of this item are finalized.

The following items are now being considered to bring plant air emissions into compliance with current Louisiana ambient air standards.

1. Main Plant Vent Stack

- a) Addition of a cleanup reactor (NR-305) and EDC absorber/stripper system to the oxychlorination vent following the existing R-304 cleanup reactor. Estimated capital requirement \$2,000,000.
- b) Addition of a compressor on the direct chlorination reactor vent with a line to recycle this vent into the new R-305 oxychlorination vent reactor. Estimated capital requirement \$100,000.

2. Dock VCM Ship Loading Vent Revisions

- a) Addition of compression and refrigeration equipment in combination with a 150 foot vent stack. Estimated capital required \$300,000.

3. Rail Car Loading Vent Revisions

- a) Addition of compression and heat exchange equipment. Extension of existing vent to tie into the main plant vent (C-500). Estimated capital required \$100,000.

4. Atmospheric EDC Storage. The following options are being considered for seven EDC storage tanks.

- a) Vent refrigeration. Requires two compressors (one in plant and one at the docks) and seven condensers. Estimated capital \$75,000.
- b) Vent stacks. Estimated capital \$50,000 for two vent stacks.
- c) Carbon absorption beds. Requires two carbon beds and regeneration facilities. Estimated capital \$150,000. (Excludes dock storage tank)

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- d) Addition of floating roofs. Estimated capital \$200,000.

Problem Description

State air pollution regulations require that all industries meet a non-methane hydrocarbon standard of 160 micrograms per cubic meter in the ambient air beyond the nearest plant property line. The VCM Plant main vent (C-500), VCM dock loading facilities, VCM rail car loading facilities and seven atmospheric EDC storage tanks emit hydrocarbons at levels which exceed this regulation. This regulation will require a greater than 90% reduction of hydrocarbon emissions from these sources or the extension of their vents to disperse emitted hydrocarbons to acceptable levels. State law requires total compliance with this regulation by June 1, 1975. An implementation schedule to meet the above regulations must be submitted to the state by October 25, 1973.

Alternatives

1. Seek exemptions by direct discussions with the State Control Commission and through groups such as the LCA and MCA. The ambient air regulations are believed to contradict the intent of the emission regulations (a separate law) which exempts nonflammable vents. The plant presently is in compliance with the emission regulation because of exemptions granted under this law.
2. Extension and addition of vent stacks to disperse hydrocarbons to below the 160 μg per cubic meter standard. Estimated capital \$500,000.
3. Vent incineration. This alternative will include in-plant distillation of plant tars to recover EDC and incineration of the plant vent plus the tars and light ends with anhydrous HCl recovery. Estimated capital \$3,400,000 plus \$575,000 per year operating costs.

Project Economics Summary

No economics are calculated on this item. The capital requirement of \$2,700,000 is based on Items 1, 2, 3, & 4d.

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